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FIFTEENTH BIENNIAL REPORT

OF THE

BOARD OF HORTICULTURE

STATE OF OREGON

1919

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FIFTEENTH BIENNIAL REPORT

OF THE

Oregon BOARD OF HORTICULTURE

TO THE

THIRTIETH LEGISLATIVE ASSEMBLY

REGULAR SESSION

OF THE

STATE OF OREGON

1919

1859

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BIENNIAL REPORTS OF COMMISSIONERS

Report of Chas. A. Park, President and Commissioner for the Second District.

To the Honorable State Board of Horticulture:

I herewith submit my report for the term ending December, 1918, as Commissioner of the Second Horticultural District of the State of Oregon, which district comprises the counties of Lane, Linn, Marion, Lincoln, Benton and Polk. The fruit raising section of the district lies mostly in the Willamette Valley, although excellent fruit of some varieties is grown in the valleys of the coast counties.

The horticultural people have reason to be greatly encouraged by the conditions during the past year. The producers of small fruits, such as gooseberries, strawberries, currants, raspberries and loganberries have received very remunerative prices for everything that they raised, the local canneries and fruit juice factories taking everything. The cherry crop was a very fair crop, of excellent quality and price higher than at any time in the history of this valley. The pear crop was good, of most excellent quality, free from scab. The price ranged as high as $50.00 per ton for Bartletts at the canneries. The fall pears were shipped to eastern markets, netting a price better than ever received before. The apple crop was not large and was more wormy than usual. The prune crop was more than 100 per cent, Oregon producing at least 50,000,000 pounds of dried prunes. The Government set the price on dried prunes and also commandeered the whole crop, so that the winter was practically over before any prunes were released for the open market. The fruit juice business has been greatly stimulated by the plants located in Salem. They have enlarged their ability for greater output and are carrying on a very active campaign for stimulating the consumption of fruit juice by the public. The fruit plants have also added the manufacture of jams and jellies to their activities. All of the canneries, evaporators and fruit juice factories have put up everything that they can buy in the way of fruit products during the past year. The Wittenburg King evaporators operated largely on vegetables and had large contracts with the Government to furnish them the dried products. I do not have the data showing what has been paid out during the past season for fruit products in the State, but I have an estimate that in Marion County there was paid out $2,275,000.

The pests and fungous diseases that attack the fruit plants and trees have not been as injurious during the past season, save the exception of the codling moth. The increased activity of the codling moth was probably due to the excessive hot weather we had during the summer. Fire blight in the Willamette Valley has not been on the increase. It has been held well in check. The inspectors in the various counties have been diligent during the active period of the fire blight, cutting out and destroying limbs they found affected with it. The methods that we have used in combatting the fire blight in the Willamette Valley have proved effective.

The war has made a difficult condition in the way of labor during the past year. It has been difficult for the fruit grower to get efficient

THE WALLACE PEAR ORCHARDS, NEAR SALEM

help to properly take care of his crops. The price of farm labor has increased materially and it has been a question whether the farmer would be able to make this increase and continue with his work, or whether he would have to cut down his work to just what he could do himself, taking what he needed for himself first, and disposing of what surplus he may have to those who do not produce.

As President of the Oregon State Board of Horticulture and Quarantine Officer, I wish to state that the conditions concerning the shipment of potatoes from California into Oregon have not been very satisfactory. We have been as courteous as we could be in allowing potatoes that had been thoroughly inspected to come into the State. But we find that the matter of inspection is very difficult and we have almost been driven to the point of putting on an absolute quarantine against the shipment of potatoes into the State from districts infested with the tuber moth. Last winter, I had a conference with the Horticultural Commissioner of California concerning the condition of the shipment of potatoes from California into Oregon, and he suggested that we have a conference with potato growers, so that they might see the danger they were in in having their market curtailed, and had put on foot a conference of horticultural men from all the western states to be held at Riverside, California, in November. On account of the influenza, this meeting has been postponed until next May, at which time they wish to take up the quarantine of all matters pertaining to horticulture, so that there may be some uniform rules adopted by all of the states.

The Horticultural Board of the State will do its utmost to keep from this State the tuber moth, which would be a great menace to the potato crop. All of the horticultural inspectors have been instructed to use the utmost diligence in inspection of all potatoes coming from California.

A few years ago, the alfalfa weevil was confined to Utah and the southeastern corner of Idaho. Its advance is slow, but sure. A small area in the western part of Idaho along the river out of Payette has become infested with the alfalfa weevil and this section is contiguous to an alfalfa producing valley running down from Ontario toward Burns, and we ought to use the greatest possible care to prevent the introduction of the alfalfa weevil into Oregon.

There have been no new quarantines issued since our last report, but all the quarantines in force will be published in our forthcoming report.

CHAS. A. PARK,
Horticultural Commissioner Second District.

Salem, Oregon, December 31, 1918.

Report of C. C. Atwell, Commissioner First District

To the Honorable State Board of Horticulture:

Owing to the comparatively recent date of my appointment to this board, and the depleted condition of its fund, I am unable to make an extensive report.

My official activities have been limited to imperative calls. Several inspectors have been appointed in counties whose inspector had resigned, owing to the inadequate compensation allowed by law.

40-ACRE PRUNE ORCHARD OF COMMISSIONER PROF. H. C. ATWELL, FOREST GROVE

Prunes, loganberries, black raspberries and walnuts are the only horticultural crops commercially grown in this district, except occasional planting of other fruits and nuts. The prune industry has assumed large proportions, especially around Forest Grove, and in Yamhill County. Returns the past season from evaporated prunes have brought nearly a quarter million dollars to the growers of the former locality. Prices for the varieties named have been exceptionally good, higher than may be reasonably expected in the years to come. Expenses, however, have been largely increased, mainly in the labor item. Labor has been, in many cases, difficult to secure, but no great loss has been experienced from that cause.

Fruit growing, in this district, has been very largely a matter of normal development, orchard exploitation not having found, apparently, a congenial field. For this reason the industry has had a healthy, rather than stimulated growth. It is to be hoped that the high prices for prunes received the past season will not induce an indiscriminate planting of prune trees, and the exploitation of the "ten acre tract with care for five years." Prospective planters should remember that estimates are usually underestimated as to expense and time, and overestimated as to early profits.

This district is now well provided with canneries and juice plants, affording a ready market for berries and the miscellaneous fruits, for which the small grower has no other adequate outlet.

Those growers whose business is to produce fruit on a commercial scale are reasonably diligent and successful in combatting orchard pests. Their labor is, however, largely increased by the negligence and apathy of those with whom fruit growing is only a side line. The work of education and elimination which the board is carrying on, through country inspectors is, however, gradually reducing the number of neglected orchards. Careful inspection of the Portland markets has made it unprofitable for the farmer to seek an outlet there for his wormy and diseased fruit. Such fruit, when condemned, is donated to some charitable institution. The canneries also demand a fairly good grade of fruit. The result of these conditions is to stimulate better horticultural practice among the growers.

So far as concerns imported pests, the main activity of the board has been directed against the potato tuber moth. This work is carried on chiefly by the state inspector, who resides in Portland, the main avenue for importation of the moth.

Speaking generally, I would say that horticultural conditions in this district are good, and such as to indicate a normal growth and profitable future for the fruit industry.

H. C. ATWELL,
Commissioner First District.

Forest Grove, December 30, 1918.

Report of Albert C. Allen, Commissioner for the Third District.

To the Honorable State Board of Horticulture:

I respectfully submit my report for your consideration.

The third district consists of the counties of Douglas, Josephine, Jackson, Klamath, Lake, Coos and Curry. Owing to the lack of sufficient funds for the use of the members of the Board, it has been very difficult to carry out the work as it should be done. It was impossible to visit most of the counties comprised within my district; however, I have made every effort to plan my private work in such a way as to permit of my making visits to outside counties where otherwise it would be impossible.

Owing to the chaotic condition of the country in general the agricultural and horticultural industries have suffered accordingly. This, added to the fact that, in Southern Oregon we have had five straight seasons of deficient moisture, it has been exceptionally hard on all unirrigated sections. On the visits which I made the past summer to Eastern Oregon I found conditions in a lamentable state. Bodies of water which had heretofore been ample had either dried up entirely or were so low as to be practically of no use for irrigation purposes. The Chewaucan Marsh, which is the heart of a large stock producing country, was so dry that but a very small proportion of the usual quantity of hay could be cut. At one ranch, where the writer made an investigation during the latter part of July, the marsh lands had dried up to such an extent that but little hay could be cut. In fact, where there were usually from six to seven stacks of hay, there was but one. In speaking to the owner he said that unless the rains came on sufficiently early to start his pastures he would lose practically all his stock during the winter and his chances of getting them through, even then, would be due entirely to whether the snow covered the pastures. Throughout the entire Eastern Oregon country these drought conditions maintained. There were many square miles of ranches which had been taken up as dry farms that were absolutely deserted. One could drive for miles past ranch after ranch without seeing a sign of life.

Silver Lake, which has always been a considerable body of water, was absolutely dry and good crops of rye and oats were being raised on its bottom. Many of the stockmen who heretofore had wintered large numbers of cattle, had practically none on hand, they having sold at a sacrifice, fearing the coming winter. The sheep men were equally worried over the future. The range was dry and hay was selling at such a figure that it was almost prohibitive for feeding stock for any length of time, and it was almost impossible to get it even at high figures. However, in October, considerable rain fell throughout the district and the pastures had begun to get green. This will help providing the fall of snow is not too heavy or the winter too severe. For the first time in history the swamp grasses on the swamps of Upper Klamath Lake were cut and large stacks of hay were standing ready for feeding cattle in that section.

The drought conditions affected the orchards in other counties in almost the same degree. Throughout my district, whether in agriculture or horticulture, wherever there was sufficient irrigation, good crops was the result. There has been a struggle in Jackson County for a number of years to get general irrigation but up to a short time ago all efforts for this on a large scale have proved a failure. During the summer a large irrigation district was voted and when this is accomplished, much better conditions will maintain in the Rogue River Valley. Irrigation districts also are being formed and more irrigation installed in many counties.

Labor conditions have, of course, been bad, so bad that it was hard to get sufficient help to carry on operations. In many places the women have stepped into the breach and have helped out wonderfully. This is particularly true in the fruit districts, where their work has been eminently satisfactory. Last spring Southern Oregon was visited by the most severe frost in its history. This was combatted by a large number of growers by very heavy firing in the orchards to save the crop. There is no doubt in the world but that this operation saved a large proportion of the fruit. Blight in most sections has been kept well under control and has caused no excessive losses. Douglas County, which has heretofore been considered by many residents as immune from the disease, was struck this summer in Garden Valley. A number of years ago there was a slight outbreak near the Soldiers' Home. Prompt action on the part of the inspectors eradicated it so that it has not made its appearance, so far as I know, until this summer. Every effort will be made to eradicate it this year.

The fruit crop generally throughout my district, has been small, this due to a combination of circumstances—light setting of fruit, frost and drought. The prices for the past season have been exceedingly good and those growers who had crops are realizing good profits. The embargo on fruit to Europe has been felt, especially in the Newtown apples. However, to offset it this season, the crop has been small and it is expected that good prices will be realized.

The codling moth has caused considerable damage this season, due to conditions which were very favorable to its propagation. Douglas County's fruit production is rapidly increasing and it has been a source of considerable worry to the writer owing to the fact that it has been so hard to keep an inspector in that county on account of the scarcity of competent men. The former inspector, Mr. Strang, accepted a position under the Bureau of Markets and it required some time to find a successor. Mr. Earl Pearcy was finally appointed in his place and for several months was very energetic in his work. He was called into the military service and at the present time Douglas County is without an inspector. This is particularly unfortunate on account of the outbreak of blight and his leaving at a time when his work was so badly needed. The growers realize their danger and are doing all in their power to keep things going pending the appointment of a new inspector. Jackson and Josephine Counties have been more fortunate in that their inspectors were all above draft age and the force has not been curtailed.

The principal duty of the inspector in Klamath County is the inspection of potatoes shipped in from California. Klamath County is coming rapidly to the fore as a producer of good potatoes and every effort is being made to keep the tuber moth, which is so prevalent in California, from being introduced here. A large number of shipments have been condemned and sent back to California from Klamath Falls. I would like to emphasize the importance of enforcing this quarantine and the close watch of potatoes in the State of Oregon. Up to the present, we have no knowledge of the appearance of the tuber moth in any of our potato districts but it is going to require the strictest inspection to keep them out and if they do appear, nothing but the most drastic measures should be taken for the immediate eradication of them. It is hoped that some method of disinfecting can be devised by which potatoes can be treated in the car to kill the moths or larvae which may be in the potatoes imported into the State. Mr. C. C. Cate, the Jackson County pathologist, made an experiment the past season which at least looks encouraging. Of course, he has made only one experiment and does not claim this as being final. He placed a small amount of carbon disulphide in a bell jar with some infested tubers. When they were removed he found that all the larvae had been killed. The amount of the carbon disulphide he used in this experiment was such as to make about one pound to one thousand cubic feet. It seems possible that by placing either this or some other substance in the car at point of shipment, the tubers could be thoroughly disinfected by the time of their arrival so as to reduce the danger of infestation to a minimum. The moths or larvae must have air and if the air is impregnated with some such disinfectant, it is natural to suppose that it would penetrate to the pests and kill them. Of course, there is the chance that this will not be entirely satisfactory as the chemical used may have some effect on the quality of the potato or in large quantities may not have the desired result, but the experiment so far as it went looks encouraging. I have taken the matter up with the United States Department of Agriculture and with further work on the part of Mr. Cate and others something may be worked out.

I think I may say without fear of contradiction, that the work of the State Board of Horticulture in this one matter of keeping the tuber moth out of the State of Oregon, has resulted in the saving of millions of dollars. The average grower, or in fact any one not entirely conversant with the subject, can hardly appreciate the extreme danger to the potato crop from this source. The rapidity with which the tuber moth multiplies is astounding. An experiment made in the pathologist's office in Jackson County with two tubers infested with the moth, showed how rapid the reproduction was. In a comparatively short time, from these two tubers, over two hundred moths and larvae were hatched. In fact, we were able to supply preserved samples of both the larvae and the moth to a great number who applied to us for them. If the State Board of Horticulture had done nothing else, this item of preventing the introduction of the tuber moth would be sufficient to have paid thousands of times over for all the money spent by this organization.

A great many experiments have been made at the Southern Oregon Experiment Station under the direction of Prof. Reimer, in the matter of fertilizers and blight control. It has long been recognized that the greatest hope for fruit growers to control blight has been in the possibility of producing a blight resistant tree. Prof. Reimer, whose work in this line has received national attention, spent a considerable length of time in China looking for a blight resistant stock. He has at present, growing in his experimental plot, some trees which are very promising. At the present time, however, our only hope to control this disease is its thorough eradication by cutting out the diseased parts and thoroughly disinfecting. There is no question but what the greatest proportion of infections are caused by holdovers in the roots of the trees. We have found that wherever a thorough cleanup of the roots has been made, followed by a thorough cleaning of the tops;

but little reinfection occurs. It goes without saying that where one has a holdover in the root of the tree, that the cutting out of the blight in the top will not prevent reinfection.

A number of growers were greatly puzzled as to why, when no blight was visible in their groves in the tops of the trees, they would still have, later on, heavy reinfections. In most of these cases it was shown that the source of the infection was in the roots and as fast as it was removed from the tops, crawling insects would carry it from the roots back up to the limbs and twigs.

The matter of a proper disinfectant for wounds and tools has been the subject of considerable investigation. It has been known for a long time that the standard disinfectant, bichloride of mercury, has not proved efficient. This was because when the bichloride comes into contact with the albumenoids in the tree, it is rendered inert. In a great many experiments made the past season, Mr. Reimer has found that a solution of cyanide of mercury at one to five hundred, has proved absolutely effective in the treatment of the wounds. However, strange as it may seem, this disinfectant has not proven satisfactory for tools, the bichloride of mercury proving more efficient for this latter purpose. He will make further experiments and hopes to obtain a disinfectant which will be equally effective on both tools and wounds. We believe that in the light of these experiments this is the most satisfactory disinfectant to use. In large cuts it is advantageous to apply, after the treatment, a solution of cresol to act as a repellent for insects. This merely prevents insects lighting on the fresh wound and gives it a chance to heal sufficiently to prevent reinfection.

Mr. Reimer's experiments in the use of sulphur for fertilizing alfalfa is probably sufficiently well known by this time so that all alfalfa growers are acquainted with the result. In Jackson County he has secured enormous increases in yields on alfalfa by the application of sulphur.

The attitude of the different counties in the matter of employing county agents has been gratifying. At first some of the counties looked upon the employment of county agents with suspicion but wherever a county agent has been installed, the benefits received from that office have been so great that, with rare exceptions, these counties would not again be without this valuable aid.

On account of the rapid rise of materials and labor it is incumbent upon growers today to get the most out of their work; for this reason, the old slipshod method of growing crops will not suffice. The appearance of diseases and pests necessitates the constant care and scientific attention of experts in order to properly combat them. The old method of obtaining information over the back fence has proven disastrous and it is the man who makes use of the county agents and other experts available, who is getting results.

The horticultural industry for the past few years has had some very hard knocks, but the writer sees no reason for the horticulturists to be discouraged. By the use of modern investigation, scientific methods and application of strict business principles to their operations, success may only be obtained. The old hit-or-miss methods in both horticulture and agriculture have seen their day and until the producers attempt the proper methods, they can not expect success.

INSPECTION FORCE, SOUTHERN OREGON, READY TO START OUT. ALBERT C. ALLEN, COMMISSIONER, MEDFORD

The United States Bureau of Markets, which has recently been inaugurated, is a long step forward and will prove one of the greatest factors in the future success of our horticultural and agricultural pursuits. Besides the proper cultural and marketing methods, the proper selection of varieties compatible with the conditions is an absolute necessity. A great many growers have realized this latter condition and are, and have been, removing undesirable varieties of fruits from their orchards. Certain districts are preeminently successful in raising certain kinds of fruit and it is the height of folly for them to persist in trying to realize from unprofitable varieties.

The Federal Government has recognized the fact that cooperation is a basic necessity of the horticultural and agricultural industries—not only cooperative in the matter of marketing their products, but also in the manner of producing. Every effort is being made to enlighten the growers on proper growing methods and also the proper manner of marketing their product. Strange as it may seem, the average tiller of the soil looks with suspicion upon any attempt to aid him in his methods. There seems to be an undercurrent of feeling among certain producers that any attempt to organize or instruct them is done with some ulterior motive. There is probably no business in the world that is so thoroughly disorganized as that of the farmer, and in a lesser degree, the horticulturist. Cooperative associations are born and die from lack of support fostered by suspicion, but our only hope is in this banding together for the common good. The establishment of the Bureau of Markets, experiment stations, county agents, etc., is merely an attempt to bring order out of chaos until the time arrives when growers will get together and use the proper methods of production, and cooperate, both in this and in the matter of marketing their products. Till then, they can expect more or less failures.

One bright spot that appears today is the fact that the Federal Government has recognized this condition as vital and is ready and willing to extend its aid to all who will receive it. The writer sees no reason to be discouraged in the production of fruit, for out of all this chaos is bound to come a condition upon which the industry can get down to sound business principles, and once it does, success will crown our efforts.

A. C. ALLEN,
Commissioner for Third District.

Medford, Oregon, November 30, 1918.

Report of C. A. Macrum, Commissioner for Fourth District

To the Honorable State Board of Horticulture:

I herewith submit my report as Commissioner for the Fourth District.

In general, disease and pests have been well controlled, only in isolated instances has any disease shown a tendency to marked activity. Fire blight is present in all counties east of Wasco and in the southern and eastern part of Wasco. None has been found west of Eightmile Creek nor in the Mosier district. County Inspector C. F. Galligan and Deputy Inspector E. R. Lafferty have been active in handling the blight and have kept it well under control in the sections where it is

40-ACRE APPLE ORCHARD OF COMMISSIONER DR. C. A. MACRUM, MOSIER present. Very few infections have been found in Hood River County. County Inspector F. W. Angus has been successful in stamping it out when reported. No infections have been found in the lower valley. Those found and removed have been in the upper valley. In many orchards on the east side, anthracnose has developed to rather an alarming extent. Mr. Angus is engaged in an active campaign of instruction, among the owners of infected orchards, on the management and treatment for anthracnose. He attributes the prevalance of anthracnose to the fact that the growers have practically ceased to apply Bordeaux spray in the past few years. The damage to fruit from scab or fungus has been very light during the past season. The spring of 1918 was very dry and unfavorable to severe scab development; however, it must be taken into consideration that the spraying for scab was more thoroughly and intelligently carried out than in previous years.

I have been much interested in the problem of reducing the number of sprayings necessary for scab control and also in developing a spray which would resist the action of spring rains. It occurred to me that a combined Bordeaux oil emulsion spray, applied as the buds are opening, before the blossoms appear, would control scab, San Jose scale, the aphis, leaf roller, red spider, curl leaf of the peach, and the copper would be present to prevent the ravage of the anthracnose spore when the rains come in the fall of the year.

I was unable to find that the combination had been made or used. I wrote to Prof. Foster of the General Chemical Company and requested that he make the combination if he did not already have a formula at hand. Prof. Foster replied that he did not recall having seen a formula, but he would endeavor to make the combination. A year following, Prof. Foster sent me the formula together with a report on the results he had had. In this report he mentioned the successful results he had in control of the disease in prunes due to the cylindrosporum. The method of preparation is as follows: Prepare the copper sulphate solution in the usual proportions of one pound to the gallon of water, dissolve 1½ pounds of common glue in 1½ gallons of water, slack 12 pounds of lime, or stir 12 pounds of hydrated lime in water at time of using. Fill a 200 gallon spray tank three-fourths full of water. Pour 24 gallons of bluestone solution into the tank, start the agitator and add the lime milk slowly until a neutral solution is had. Test with litmus paper to tell when the solution is neutral. Add 1½ gallons of glue solution. Measure out 12 gallons of the General Chemical Company's No. 1 oil emulsion or a corresponding oil emulsion, add a little water and stir until emulsion is started as shown by the mixture turning milky. Pour into the spray tank and add water to make 200 gallons. The agitator must be kept running during the whole procedure. The spray should be applied as soon as prepared.

The above are the proportions for a 200 gallon tank. In making stock solutions for a day's spraying the quantities given can be multiplied by the number of tanks required. The strength of the Bordeaux can be varied as deemed necessary. The amount of copper sulphate in the above formula is the same as the ordinary 6-6-50. It is necessary that the Bordeaux solution be neutral and not alkaline as Bordeaux is ordinarily made. This is determined by adding the lime milk slowly allowing the lime milk and copper solution to be well mixed and testing with blue or red litmus paper to determine when the neutral point is reached. If no rain follows the application of Bordeaux oil emulsion spray for 24 hours, the spray dries thoroughly and stays on the bark of the trees throughout the season, and is effective against anthracnose development after the fall rains begin.

C. A. MACRUM,
Commissioner Fourth District.

Report of H. H. Weatherspoon, Commissioner for Fifth District.

To the Honorable State Board of Horticulture:

I beg to submit the following report for the biennial period ending December 1, 1918.

Orchard Acreage and General Conditions

During the past two years in Umatilla County there has been taken out approximately 25 per cent of the total acreage of apple orchards which formerly had been classed as commercial orchards.

In addition to this a further loss of 15 per cent has occurred on account of neglect. In the matter of prunes, cherries, peaches and small fruits conditions have not materially changed.

In Union County a decrease in acreage through pulling out and general neglect of 75 per cent has occurred in all varieties of fruits.

Conditions in Baker and Grant Counties have not materially changed.

Malheur County has suffered a loss of at least 50 per cent through general neglect and the pulling up of apple trees. The prune tree acreage has slightly increased.

Umatilla County has now approximately 90,000 apple trees bearing, 48,000 prune trees, 15,000 cherry trees and 12,000 peach trees, which may be classed as commercial orchards.

Total value of fruit crop in Umatilla County for the year 1917 was approximately as follows:

Apples	$180,000.00
Prunes	30,000.00
Peaches	20,000.00
Cherries	15,000.00
Pears, berries and other small varieties	40,000.00
Total crop	$285,000.00

For the year 1918 full returns have not been received up to this time, but gathered from what has been received the total yield in fruits in that county was smaller than the year 1917, but owing to higher prices for all varieties an estimate of $325,000.00 is none too high for this year.

Orchards generally in Umatilla County are in better condition than ever before due to the fact that prices have been better; profits have been realized and to the fact that those in the fruit business who were not fitted for the business have either pulled out their trees or sold to others who are taking better care of orchards.

Union County has now in bearing in commercial orchards 75,000 apple trees, as against 300,000 bearing and nonbearing trees two years ago. The decrease is due to trees having been pulled out owing to the fact that land in Union County is highly productive for wheat growing, and in view of the fact that apple growing up to two years ago proved actual losses to owners, and the high prices of wheat insured a good net earning on the lands, the temptation was too great. It may be said that very few of the more productive orchards on the slope lands have been pulled out; the pulling up of trees was confined more to the Grande Ronde Valley lands which are intensely valuable for wheat growing. The prune and cherry situation is about the same as two years ago.

Total production of apples in Union County for the year 1917 was $225,000.00, prunes and cherries $15,000.00, other fruits nominal. Total production for the county $240,000.00.

For the present year late frosts caught most of the larger orchards and nearly a total failure in fruits of all kinds occurred, and while figures for the year's crop are not available as yet, it is perfectly safe to estimate the crop not higher than $40,000.00.

Baker County has now bearing trees in commercial orchards as follows:

Apple	14,000
Peach	18,000
Prune	2,000

For 1917 value of crop was as follows:

Apples	$22,000.00
Peaches	12,000.00
Prunes	No record

For the present year value of crop is:

Apples	$20,000.00
Peaches	36,000.00
Prunes	No record

Late frosts cut the crop of apples at least 75 per cent; however, the peach crop got by in some manner that can not be explained.

Malheur County has now in bearing orchards the following:

Apple	125,000
Prune	80,000

A very large per cent of these trees average seven and eight years old, except in prunes of which the general average is not greater than six years. This county has been very unfortunate the past two seasons, having received severe losses in the fall of 1917 by early frost and almost a total loss during May of this year by late frost.

Total value of the crop marketed in 1917 was approximately $200,000.00, divided as follows: Prunes $125,000.00, apples $75,000.00.

A decrease of about 50 per cent in number of apple trees as against former reports is due to the fact that orchards up to two years ago showed no profits, and to the fact that all orchard lands are irrigated lands which are highly valuable for growing of alfalfa and clovers.

The high price for this product has caused the owners, who have not in the past realized any profits from orchards, to turn to the more profitable use of their lands in hay raising.

From present indications a further decrease in acreage will take place in this county, not on account of its not being a great apple country, but to the fact that growing of hay and feeding stock gives much quicker returns and apparently a more sure profit.

Grant and Harney Counties have no orchards that may be classed as commercial and while there are in these counties limited areas of lands well located for growing of certain kinds of fruits and certain varieties of apples, as yet no one has attempted a development. Now that the days of wildcatting in orchards are over, and the business is gradually falling into hands of people who make fruit growing one of profit, many interesting developments have come to light and it is an easy matter to understand with so many mistakes surrounding the inexperienced in the business it was impossible for them to make a success.

Rarely a community can be found that will grow perfectly more than three varieties of apples, while as a matter of fact, large orchard tracts can be found set to varieties entirely unsuited to the locality.

Owing to such mistakes as indicated in the preceding paragraph a moderate pulling out of trees is yet necessary in the Fifth Horticultural District.

Pests and Diseases.

A very close watch has been kept on the larger fruit growing areas in the fifth district and the result has been very gratifying. Blight no longer exists as a menace to orchards, damage from codling moth has been reduced to a minimum, and while scale in Umatilla and Malheur Counties does exist in a small way, it is handled in a manner that little or no damage results from its presence.

Blight and Holdover Blight.

It may now be safely said that the pear tree is the home of what is known as pear blight. Owing to the fact that a very small portion of the fifth district was growing pears in a commercial way when blight appeared five years ago in a severe form, we discouraged the setting of pear trees and encouraged the cutting out entirely of what pear trees were standing in the vicinity of large apple growing sections.

The result was noticeable immediately in Union County, the first county in the State to suffer severely with blight. Not a single case has come to my attention this year in Union County, a very small amount in Umatilla County and a very small amount in Malheur along the Snake River adjacent to the famous Payette bench on the Idaho side, where no care has been taken to exterminate the disease. It has been no doubt communicated to the Oregon side by insects from old pear trees on the Idaho side.

Where we cleaned out entirely all pear trees, we had no further outbreak of blight. This fact clearly establishes in my mind that holdover blight from year to year is carried entirely in the pear tree, and not in the apple tree as formerly supposed. There may be some exception to this due to elevation, as lower altitudes grow a more corky and thick bark and soft wood, both of which would protect the disease in winter. I feel that I can conscientiously recommend the extinction of pear trees as one of the surest methods of curing blight in the apple in the fifth district.

Pruning

A careful check kept on young orchards, especially in the apple, develops the fact that heavily pruned orchards in the fifth district at the age of ten years have not and are not yielding more than one-half the fruit that the more moderately pruned orchard is yielding.

It develops that the greatest damage done by heavy pruning was when the tree was from three to seven years of age. Orchards that received pruning amounting to practically cutting out water sprouts after the third year of age until same was seven years old proves to be not only an annual bearer, but the heavier, surer bearer as against the tree pruned heavily each year; thus it may be seen the average orchardist in the past has been pruning his profits away.

Varieties Best Suited For the Various Counties

To persons contemplating the setting of new orchards or top working of older orchards the following varieties will prove the most profitable in the various counties in the fifth district:

Umatilla County. Strawberries, cherries, peaches and prunes are successfully grown. In apples the Jonathan, Winesap, Stayman Winesap and Delicious appear to be the most valuable producers, while Rome Beauty and Arkansas Blacks, as well as many other varieties, do fairly well.

Union County. Delicious, Winter Banana, Rome Beauties are most profitable, with King David Gano and Newtown doing fairly well, if planted to lands having a good slope or drainage.

The Delicious and Winter Banana both appear to be at home in the high altitudes in this county, not maturing until late in October, growing to large size and very high color and very firm in texture.

Prune growing, as well as the growing of cherries, can be and is done successfully in one small district, but can not be recommended for the entire county.

Baker County. The most profitable area in this county is the Eagle Valley district and a small district along the Snake River.

In both localities apples and peaches are successfully grown. Delicious, Winesap and Winter Banana do best; Jonathan and Rome Beauty also grow well.

Wallowa County. Very fine specimens of a number of varieties have been grown along the lower Grande Ronde River and also along the Snake River in this county, but not enough is yet known of this county to warrant a recommendation of varieties.

Malheur County. Jonathan, Arkansas Black, Rome Beauty and Winesap appear to do best in the Ontario and Big Bend districts, while the Jonathan, Grimes and Delicious would be preferable in the Upper

140-ACRE APPLE ORCHARD, 7 YEARS OLD, H. H. WEATHERSPOON, COMMISSIONER AND OWNER, ELGIN

Willow Creek district. Peaches produce heavily and very fine quality in the Upper Willow Creek district.

Grant and Harney Counties. As yet only small orchards have been set in these counties and not enough is yet known to warrant a recommendation.

The Potato Industry

Noting the fact that from year to year the growing of potatoes has gradually decreased in the fifth district, and owing to the fact that this has been one of the profitable commodities grown, I have during the past two years endeavored to encourage the growing of this crop and in a measure have kept up interest in a manner that the decrease has not been so noticeable in the past two years as was formerly the case.

Summing up the entire situation among the fruit growers of the fifth district, it may be said that a better feeling now exists as to the future of apple growing. This is due to the fact that the inexperienced have gotten out of the business and the general shaking up that has taken place seems to be for the better all along the line.

Our county inspectors' reports from time to time show that the average person engaged in the business is not dependent upon book knowledge, and what others tell them about the business, but are wide-awake to the necessity of doing and doing well what is necessary to produce the best results.

H. H. WEATHERSPOON,
Commissioner Fifth District.

Report of J. E. Stansbery, State Horticultural Inspector

To the Honorable State Board of Horticulture:

Calls at docks and express companies	230
Nurseries inspected	11
Bulbs imported (foreign), pounds	26,823
Bulbs imported (domestic), pounds	3,558
Bulbs imported (total), pounds	30,381
Potatoes from California, sacks	29,450
Potatoes condemned and returned, sacks	1,778

Fumigated two cars of grapefruit from Florida.

The importation of stock into the State during past eight months has not been as heavy as in the preceding months, on account of the war, but the demand on the inspector is continuous and I hope that I have been able to accomplish some good in the work.

Somehow people are under the impression that during the war they could send and market anything, which had to be overcome, which was done by sending the bad stuff to Uncle Sam's canning kitchen to be canned for the boys in the hospitals, which amounted to about 1,000 boxes.

Respectfully submitted,

J. E. STANSBERY,
State Horticultural Inspector.

H. M. WILLIAMSON

Only a few days ago we were called upon to carry our friend,

H. M. Williamson

to his final rest, which we did Saturday, December 1, 1917, and few eyes remained dry during the beautiful ceremony at the chapel, for he was beloved dearly by us and his many friends.

Mr. Williamson was born in Petrolia, Michigan, March 1, 1851, where he graduated in college and afterwards studied law, where he was admitted to the bar. He came to Oregon some thirty years ago and established an agricultural and horticultural paper.

He was a frequent visitor at our office and soon allied his forces with us; the columns of his paper were always open to writers on horticultural subjects; while we did not always agree, his criticisms were in the spirit of kindliness and justice and his editorial columns, wrote those masterful and powerful articles so well remembered by us all, and which were always for the uplifting of the horticultural interest. He was elected secretary of this board eleven years ago, in which position he found his ideal and best expressed in an editorial of the Oregonian.

"H. M. Williamson, who died last week, will be missed by progressive horticulturists, who were always certain of receiving his support and sympathy in any of their efforts to improve their industry. He was a mine of information for those who plant and tend trees, and in his receptiveness to new ideas he was perennially young. Although excessively modest and retiring, he did a vast amount of good, and Oregon is poorer now that he is gone."

Yes! Oregon is poorer now that he is gone.

The people of the State of Oregon owe a great deal to the pioneers in horticulture, a debt which in these days of commercialism is lost sight of; those who laid the firm foundation upon which the wealth of our grand State has been built are apt to be forgotten, hence it is desirable to keep it fresh and green in the memory for years to come of those to whom we owe so much.

HENRY E. DOSCH.

HORTICULTURAL LAWS OF OREGON

1915

(Sections numbered as in Lord's Oregon Laws.)

THE STATE BOARD OF HORTICULTURE

(As amended by Section 1, Chapter 342, Laws of 1915.)

§ 5470. Board of Horticulture Constituted. There is hereby created a Board of Horticulture, to consist of five members, who shall be appointed by a board consisting of the Governor, Secretary of State, and State Treasurer. One member shall be apointed to represent each of the five districts as hereby created, to wit: (1) The first district, which shall comprise the Counties of Multnomah, Clackamas, Yamhill, Washington, Columbia, Clatsop and Tillamook; (2) the second district, which shall comprise the Counties of Marion, Polk, Benton, Lincoln, Linn and Lane; (3) the third district, which shall comprise the Counties of Douglas, Jackson, Klamath, Josephine, Coos, Curry and Lake; (4) the fourth district, which shall comprise the Counties of Wasco, Sherman, Morrow, Gilliam, Crook, Jefferson and Wheeler; (5) the fifth district, which shall comprise the Counties of Umatilla, Union, Wallowa, Baker, Malheur, Harney and Grant. [L. 1899, p. 126, Sec. 1; L. 1891, p. 174, Sec. 1; L. 1895, p. 33, Sec. 1; L. 1899, p. 55, Sec. 1; L. 1915, Chap. 342, Sec. 1.]

§ 5471. Residence of Members; Terms of Office; Qualifications. (As amended by Section 2, Chapter 342, Laws of 1915.) The members shall reside in the districts for which they are respectively appointed. They shall be selected with reference to their knowledge of and practical experience in horticulture and the industries connected therewith, and shall be engaged in practical horticulture during their incumbency of the office of commissioner. They shall hold office for the term of four years, and until their successors are appointed and have qualified unless removed by the appointing board for failure to perform their duties. Before entering upon his duties each member shall make and subscribe an oath to support the Constitution of the United States and of the State of Oregon, and to diligently, faithfully and impartially discharge the duties of his office, which oath shall be filed in the office of the Secretary of State.

§ 5472. Secretary of Board; His Salary; Oath of Office. (As amended by Section 3, Chapter 342, Laws of 1915.) Said board shall employ without their number a secretary, who shall exercise the powers and discharge the duties conferred upon him by this act, and whose compensation shall not exceed $100.00 per month, to be paid in the same manner as other State officers. Before entering upon the duties of his office the secretary shall make and subscribe an oath to support the Constitution of the United States and of the State of Oregon, and to diligently, faithfully and impartially discharge the duties of his office, which said oath shall be filed in the office of the Secretary of State. [L. 1899, p. 127, sec. 3; L. 1895, p. 34, Sec. 3; B & C., Sec. 4178; L. 1905, Chap 222, p. 385, Sec. 6; L. 1915, Chap. 342, Sec. 3.]

§ 5473. Each Member May Appoint Deputies—Their Authority. Each member of the State Board of Horticulture shall have authority to appoint, whenever it shall seem to him expedient, a special deputy or deputies, who shall be empowered to discharge any and all the duties prescribed for the members of said board in Section 5487, but the work and authority of said deputies shall be confined to the districts of the commissioners by whom they are respectively appointed. [L. 1903, p. 251, Sec. 1.]

§ 5474. Compensation of Deputies. Any deputy appointed under the authority conferred by this act shall receive as compensation for his services $2.00 per day for each day actually spent in the performance of his duties as such deputy, and all claims for compensation of such deputies shall be audited and paid in the same manner as claims of members of the Board of Horticulture. [L. 1903, p. 251, Sec. 2.]

§ 5475. Expenses, How Paid. Any expense, incurred under the provisions of Section 5474 of this act shall be paid out of the appropriation allowed to the State Board of Horticulture. [L. 1903, p. 251, Sec. 3.]

§ 5476. Meetings of the Board—Election and Duties of President. (As amended by Section 4, Chapter 342, Laws of 1915.) The board shall meet on the second Monday of April in each year. Special meetings may be called at other times by three members of the board. At the regular annual meeting of the board each year, or at any special meeting when the office of president is vacant, the board shall elect from among its members a president of the board who shall hold office until the close of the next regular annual meeting unless he ceases to be a member of the board before that time. The president shall preside at all meetings of the board and shall perform all duties imposed upon the commissioner at large of the State Board of Horticulture in Chapter 246 of the Laws of 1913. The president and secretary shall pass upon and approve or reject all claims against the State Board of Horticulture.

§ 5477. Office of Board, Where Held, When Open. The office of the board shall be located at such a place as a majority thereof may determine. It shall be kept open to the public, subject to the rules of the board, every day excepting Sunday and legal holidays, and shall be in charge of the secretary during the absence of the board. [L. 1889, p. 127, Sec. 5; B & C., Sec. 4180.]

§ 5479. Members to Visit Districts, Inspect and Quarantine Orchards. It shall be the duty of the several members of the board, and of the secretary under their direction, to visit their respective districts, and to see that all regulations of the board and all provisions of law to prevent the introduction or spread of fruit pests and diseases of trees or plants injurious to the horticultural interests of the State are enforced.

§ 5482. Upon a petition of not less than twenty-five resident fruit growers of any county of this State, the county court of said county shall appoint a county inspector whose duty it shall be to inspect orchards, nurseries, trees, shrubs, vines, fruits, vegetables, plants, packing houses, warehouses, storerooms, farms and other places within said county; to visit and inspect the fruit drying and packing plants while such plants are in operation; to enforce such regulations as may be required by the State Board of Horticulture governing the handling, drying and packing of prunes, apples, loganberries, or other fruits evaporated and packed for human consumption, and to enforce all laws of the State relating to such insect pests and such diseases as affect trees, vines, plants of any kind, or fruit or vegetables of any kind and all other horticultural laws, rules and regulations of the State; provided, however, that the inspector so to be appointed shall be recommended and certified to be competent by the commissioner of the State Board of Horticulture of the district in which said county is situated, and said county inspector shall hold his office during the pleasure of said county court.

Upon a petition of not less than twenty-five resident fruit growers of any county of the State, the county court of said county may appoint one or more deputy county inspectors; provided, however, that said deputy county inspector or deputy county inspectors, so to be appointed, shall be recommended and certified in the manner provided for the appointment of a county inspector and shall hold office during the pleasure of said county court. Every such deputy county inspector shall have and perform all the powers and duties of a county inspector. The county inspectors and deputy county inspectors and all other persons authorized to enforce the horticultural and inspection laws of Oregon are authorized and empowered to enter upon or into any premises, land, buildings, inclosures, or other places, for the purpose of inspecting any article which is subject to or may be subject to infestation with any insect injurious to any article which grows upon or in or from the soil by processes of plant growth, or the eggs, larvae of pupae of such insects or with any disease injurious to any such article or articles and for the further purpose of enforcing any of the laws of this State relating to horticultural quarantine, or horticultural inspection or the abatement of horticultural nuisances or any other duties imposed by law upon such inspectors and other persons authorized to enforce the inspection and horticultural laws of Oregon. Every person, firm or corporation doing business as a common carrier within the State of Oregon shall, upon the arrival of any shipment of nursery stock, trees, plants, vines, shrubs, cuttings, or scions, peach pits and other seeds used for growing nursery stock at the station or other place to which the same is consigned, notify the state inspector if there be one in the county in which said shipment has arrived, or if there be no state inspector in said county, shall notify the county inspector of said county and if there be neither state inspector nor county inspector in said county shall notify the commissioner of the State Board of Horticulture of the district in which said county is situated, of the arrival of such shipment and the date and place of arrival, and shall not deliver such shipment to the consignee until authorized to do so by the state inspector, county inspector or commissioner or other officer of the State Board of Horticulture; provided, however, that if such shipment originated within the State of Oregon and the notice be given personally or by telephone or telegraph and inspection has not been commenced within seventy-two hours from the time of sending notice; or if such notice be sent by mail and inspection has not been commenced within as much time more than seventy-two hours as is usually required for a letter to go from the place of arrival of such shipment to the residence of the inspector notified, then such shipment originating in

Oregon may be delivered to the consignee. It shall be the duty of the inspector or commissioner receiving notice of the arrival of any shipment of nursery stock, trees, plants, vines, shrubs, cuttings, or scions, to inspect or cause to be inspected said shipment as soon as can be reasonably done without omitting the performance of other official duties equally urgent. Upon the request of any nurseryman or tree dealer doing business within the State of Oregon, the commissioner of the State Board of Horticulture for the district in which the shipping place of business of such nurseryman or tree dealer is located may deputize a suitable person to inspect outgoing shipments from said nurseryman or tree dealer, and said nurseryman or tree dealer shall pay such person so deputized for his services while they are required by such nurseryman or tree dealer. In case the shipping business of any two or more nurserymen and tree dealers is not in the aggregate more than one person can properly inspect and such group shall make satisfactory arrangements for the payment of the person making such inspection, the commissioner may deputize a person to inspect the shipments of all members of such group. No person deputized by a [the] commissioner to inspect outgoing shipments of nursery stock shall make any certificate concerning such shipments which is not true, and no person so deputized shall allow a certificate of inspection given by him to be attached to any tree, shrub, vine, plant, scion, bud or box, crate, bale, bundle or container of the same or of any of them unless he has personally inspected the articles and all of them immediately before signing such certificate, which must be dated in writing at the time it is signed. The commissioner may revoke deputization of any such person at any time if he believes such person is not properly doing his duty.

§ 5483. **District Commissioners to Instruct and Supervise County Inspectors.** It shall be the duty of the state district commissioner to instruct and educate the county inspectors as to the laws and quarantine regulations of this State, and the rules and regulations of the State Board of Horticulture. The county inspector shall perform his duties under the general supervision of the state district commissioner for said county, to whom he shall make reports in the manner prescribed by the State Board of Horticulture. [L. 1905, Chap. 222, p. 384, Sec. 2.]

§ 5484. **Compensation of County and Deputy County Inspectors; Report of Time and Expenses.** (As amended by Chapter 174, Laws of 1913.) Such county inspector and each deputy county inspector shall be paid for his services by the said county the sum of $3.00 per day and his actual necessary expenses incurred in the performance of his duties. The county inspector and each deputy county inspector shall report monthly to the commissioner of the State Board of Horticulture of the district in which he is employed the time for which he is entitled to pay during the month for which such report is made and a statement of his actual necessary expenses incurred in the performance of his duties as such inspector or deputy inspector with vouchers for such expenses, and the commissioner shall certify the same to the county court of the county before such compensation and expenses shall be paid. The county court of each county shall supply the county inspector and deputy county inspectors with such blanks, stationery and postage as are needed in the performance of their official duties. If it appear to the county court of any county that it will be for the best interest of the people of such county to do so, it may agree to pay, and pay, to its county inspector a larger sum than $3.00 per day for his services.

§ 5485. Inspector of Adjacent County May Perform Duties When County Fails to Appoint. If any county for any reason fails to appoint a county inspector as herein provided, then the inspector of any adjacent county may perform such services, and his compensation and the necessary expenses incurred in the performance of his duty shall be charged against the county where the service is performed, as if he had been appointed by the county court of said county. [L. 1905, Chap. 222, p. 384, Sec. 4.]

§ 5486. Appeals From County Inspectors to District Commissioner. The state district commissioner of horticulture shall hear and promptly decide all appeals from the county inspectors in his district, and his decision shall have full force and effect until set aside by the courts of the State. All appeals from county inspectors to the district commissioners shall be under the form and regulations as prescribed by the State Board of Horticulture. [L. 1905, Chap. 222, p. 384, Sec. 5.]

§ 5487. It shall be the duty of the several members of the board and of the state and county inspectors under their direction, whenever they deem it necessary to cause an inspection to be made of any orchards, nurseries, trees, plants, vegetables, vines, or any fruit-packing house, storeroom, salesroom, or any other place within their district, and also of any fruit trees or nursery stock shipped from beyond the limits of this State, and if found infested with any pests, diseases or fungous growth injurious to fruits, plants, trees, vegetables or vines or with their eggs or larvae liable to spread to other places or localities, or of such nature as to be a public danger, they shall notify the owner or owners, or persons in charge of or in possession of such articles, things, or places, that the same are so infested, or in case such fruit trees or nursery stock, although apparently sound and not infested by any pest, shall have been from an infested district beyond the limits of this State, they shall also so notify the owner or owners or persons in charge of or in possession of the same, and shall require said persons to eradicate or destroy said insects or pests or their eggs or larvae, or such imported fruit trees, or nursery stock of infested districts without the limits of the State, or to treat such contagious diseases within a certain time to be specified in said notice. Said notice may be served upon the person or persons, or any of them, owning, having charge or having possession of such infested place, article or thing, by any member of the board, or by a State or county inspector, or by any person deputed by a member of said board for that purpose, or it may be served in the same manner as a summons in an action at law. It shall be the duty of the sheriff of any county to serve such notice when requested to do so by the commissioner of the board whose district includes such county. Such notice shall state the spray to be used or the treatment to be applied for the eradication of said insect pests, their eggs and larvae, and contagious diseases and fungous growths, and the abatement of the nuisance aforementioned. The treatment may include the destruction of the infested or infected articles if such destruction is necessary in the judgment of the person inspecting the same under the authority conferred by this law. And any and all such places, orchards, nurseries, trees, plants, shrubs, vegetables, vines, fruit or article thus infested are hereby declared to be a public nuisance; and whenever any such nuisance shall exist in any place in the State on the property of any owner or owners upon whom or upon the person in charge or possession of whose property notice has been served as aforesaid, and who shall have failed or refused to abate the same within the time specified in such notice, or on the property of any nonresident or any property not in the possession of any person and the owner or owners of which can not be found by the resident member of the board or the State or county inspector after diligent search within the county in which such nuisance exists, it shall be the duty of the board or the member thereof in whose district the nuisance shall exist, or the State or county inspector under his or their directions, to cause such nuisance to be at once abated by eradicating or destroying said insects or pests or their eggs or larvae, or by treating or disinfecting or destroying the infested or diseased articles. The expense thereof shall be a county charge and the county court shall allow and pay the same out of the general fund of the county. The date and amount of every such payment shall be immediately entered by the county clerk, in the public record book to be known as the horticultural lien book, and said entry shall give a description of the property and premises upon which such nuisance has been abated sufficient for identification, and shall also state the name of the owner or reputed owner of said property and premises, if known, and thereupon the sum so paid shall be and become a lien upon said property and premises, and such lien shall be preferred to all subsequent liens, mortgages and other incumbrances. Thereupon it shall be the duty of the county clerk to forthwith notify the owner or reputed owner, if known, of the date and amount of said lien, and that the amount thereof with the added sum of one dollar for recording and discharging fee must be paid forthwith, and such notice shall be deposited in the postoffice with the postage prepaid, addressed to the owner of reputed owner or owners of said property and premises at his or her or their last known address. If the amount of said lien and fee is paid before suit is commenced to foreclose said lien, the county clerk shall thereupon release said lien upon said horticultural lien book. If the same has not been paid at the expiration of five months from the date of entry of the lien, the county clerk shall notify the district attorney for the county in which the lien is recorded, and the district attorney shall thereupon and within six months from the date of entry of said lien, in the name of and for the benefit of the county in which said lien is recorded, proceed against said property and premises by a suit in equity in the circuit court to recover the amount of said lien, fee, costs and a reasonable attorney's fee. The proceedings in such case shall be governed by the same rules as far as may be applicable as a suit to foreclose a mechanic's lien, and the property shall be sold and the proceeds applied in like manner.

The board is hereby invested with the power to cause such nuisances to be abated in a summary manner.

§ 5488. **Duties of Secretary.** It shall be the duty of the secretary to attend all meetings of the board, and to preserve records of the proceedings, correspondence, and actions of the board, to collect books, pamphlets, periodicals, and other documents containing valuable information relating to horticulture, and to preserve the same; to collect statistics and general information showing the actual condition and progress of horticulture in this State and elsewhere; to correspond with agricultural and horticultural societies, colleges, and schools of agriculture and horticulture, and such other persons and bodies as may be directed by the board, and prepare as required by the board reports for publication. [L. 1889, p. 129, Sec. 9; L. 1895, p. 38, Sec. 9; B. & C., Sec. 4186.]

§ 5489. **Biennial Report; Compensation of Board Members.** The board shall biennially, in the month of January, report to the legislative assembly a statement of its doings with a copy of the treasurer's reports for the two years preceding the session thereof. The members shall receive as compensation their actual expenses while engaged upon the work of the board or the enforcement of the provisions of this act, and shall be allowed $3.00 a day for the time actually employed. [L. 1889, p. 129, Sec. 11; L. 1895, p. 38, Sec. 11; B. & C., Sec. 4187.]

§ 5490. **Duties of Treasurer.** The treasurer shall receive all moneys belonging to the board, and pay out the same only for bills aproved by it, and shall render annually to the board a statement in detail of all receipts and disbursements. [L. 1889, p. 129, Sec. 12; L. 1895, p. 39, Sec. 12; B. & C., Sec. 4188.]

§ 5491. **Board to Report to Legislature.** The said board shall report to the legislative assembly, commencing in January, 1891, what, if any, legislation is needed in aid of the horticultural and fruit growing interests of the State. [L. 1889, p. 130, Sec. 14; B. & C., Sec. 4189.]

§ 5495. **All Prunings and Cuttings Required to Be Burned.** It shall hereafter be unlawful for any person, firm, or corporation owning or operating any nursery, fruit orchard of any kind, hopyards, flower gardens, or ornamental trees to throw any cuttings or prunings from any fruit trees, nursery stock, ornamental trees, or hop vines into any public road, highway, lane, field or other inclosure, or into any watercourse of any kind; but shall destroy such cuttings or prunings with fire within thirty days from the time such cuttings or prunings are made. [L. 1899, p. 97, Sec. 1; B. & C., Sec. 4190.]

§ 5496. **Owners of Nurseries, Etc., Required to Spray.** It shall hereafter be the duty of any person, firm, or corporation owning or operating any such nursery, fruit orchard, hopyard, flower garden, or ornamental trees, and knowing such to be infected with any kind of insects, pests, or disease, to immediately spray or destroy the same in such manner as the fruit commissioner for his district may direct. [L. 1899, p. 97, Sec. 2; B. & C., Sec. 4191.]

§ 5499. It shall be unlawful for any person, firm or corporation to import or sell any infested or diseased fruit of any kind in the State of Oregon, except that such fruit may be sold to evaporators, fruit canneries, fruit product factories, or other byproduct factories under the following conditions:

First. Such fruit so sold shall be used solely for the production of manufactured fruit products, beverages, or other manufactured products or byproducts.

Second. The nature of the infestation or infection shall not be such as to make the article of food or beverage manufactured from such fruit unhealthful or unfit for use as a food or beverage.

§ 5500. **Packing, Etc., or Delivering for Shipment Infected Fruit, Etc., a Misdemeanor.** Every person who packs or prepares for shipment to any point within the State, or who delivers or causes to be delivered to any express agent or railroad agent, or other person, or to any transportation company or corporation, for shipment to any point without the State, any fruit or fruits, either fresh, cured or dried, that is infected with insect pests or diseases injurious to trees, shrubs, plants, fruits, or vegetables, is guilty of a misdemeanor. [L. 1899, p. 98, Sec. 6; B. & C., Sec. 4195.]

§ 5501. **Penalty for Violating Provisions of Act.** Any person, firm or corporation violating any of the provisions of this act shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not less than $25.00 nor more than $100.00 [L. 1899, p. 98, Sec. 7; B. & C., Sec. 4196.]

§ 5502. **Commissioner of Horticulture to Present Evidence and District Attorney to Prosecute.** It shall be the duty of the commissioner of the State Board of Horticulture of the district in which a violation of this act occurs to present the evidence of the case to the district attorney, whose duty it shall be to prosecute any person guilty of a violation of this act, which prosecution may be brought in any of the justice courts of this State. [L. 1899, p. 98, Sec. 8; B. & C., Sec. 4197.]

OF PACKING AND LABELING FRUIT AND NURSERY STOCK

§ 5503. **Green Fruit Packed for Market to Be Labeled.** Any person, firm, association or corporation engaged in growing, selling or packing green fruits of any kind within the State of Oregon, shall be required, upon packing any such fruit for market, whether intended for sale within or without the State of Oregon, to stamp, mark, or label plainly on the outside of every box or package of green fruit so packed, the name and postoffice address of the person, firm, association, or corporation packing the same; provided further, that when the grower of such fruit be other than the packer of the same, the name and postoffice address of such grower shall also prominently appear upon such box or package as the grower of such fruit. [L. 1907, Chap. 11, p. 22, Sec. 1.]

§ 5504. **False Representation as to Place of Raising or Packing Fruit Forbidden.** It shall be unlawful for any dealer, commission merchant, shipper or vendor, by means of any false representations whatever, either verbal, printed or written, to represent or pretend that any fruits mentioned in Section 5503, were raised, produced or packed by any person or corporation or in any locality, other than by the person or corporation, or in the locality where the same were in fact raised, produced or packed, as the case may be. [L. 1907, Chap. 11, p. 22, Sec. 2.]

§ 5505. Possession of Fruit Falsely Labeled; Evidence. If any dealer, commission merchant, shipper, vendor or other person, shall have in his possession any of such fruits so falsely marked or labeled contrary to the provisions of Section 5503, the possession by such dealer, commission merchant, shipper, vendor, or other person, of any such fruits so falsely marked or labeled shall be prima facie evidence that such dealer, commission merchant, shipper, vendor or other person, has so falsely marked or labeled such fruits. [L. 1907, Chap. 11, p. 22, Sec. 3.]

§ 5506. Penalty for Violation of Act. Any person violating any of the provisions of this act shall be deemed guilty of a misdemeanor and, upon conviction thereof, shall be punished by a fine of not less than $5.00, nor more than $500.00, or by imprisonment in the county jail not less than ten nor more than one hundred days, or by both such fine and imprisonment, at the discretion of the court. [L. 1907, Chap. 11, p. 22, Sec. 4.]

§ 5507. Liability for False Representation as to Variety of Nursery Stock. Any person selling nursery stock, or young trees, and representing the same to be of a variety different from what said nursery stock of trees actually are, shall be required to replace all such trees with stock of the same grade and variety as the original order and shall be required to make reasonable compensation to the purchaser for expenses and loss of time due to such error having been made. [L. 1907, Chap. 57, p. 109.]

(Chapter 393, Laws of 1919.)

AN ACT

[H. B. 455.]

Providing the character of label to be used on labeled goods packed within the State of Oregon for shipment to other states.

Be It Enacted by the People of the State of Oregon:

Section 1. That all persons, firms or corporations operating under their own private brand in the State of Oregon in the business of packing or canning fruit or vegetables, either fresh, canned, evaporated or otherwise, shall plainly designate on such private brand that goods were Oregon grown or packed in Oregon. For the purpose of this act it will be sufficient for the firms whose headquarters are in Oregon to either designate the local address of the cannery or to designate the location of their main office in the State of Oregon. This act shall not apply to sales to wholesalers, packers or others for repacking.

Section 2. Any person, firm or corporation which shall fail, neglect or refuse to comply with the terms of this act shall upon conviction thereof, be fined for each offense in a sum not less than $10.00 nor more than $50.00.

QUARANTINE LAW

(Chapter 246, Laws of 1913.)

AN ACT

[H. B. 129.]

To provide for the protection of horticulture and to prevent the introduction into this State of insects or diseases or animals injurious to fruits or vegetables of any kind, fruit trees, vines or bushes or growing products of the soil; providing for a quarantine to prevent the introduction of such insects, diseases and animals into the State and their spread from infected districts within the State to uninfected districts; making a violation of this act a misdemeanor and providing the penalty therefor; providing for a State inspector and defining his duties and fixing his compensation; providing that said act shall be an emergency measure and go into effect immediately, and repealing conflicting acts and parts of acts.

Be It Enacted by the People of the State of Oregon:

Section 1. That whenever, in order to prevent the introduction into the State of Oregon of any tree, plant or fruit disease, or of any injurious insect or animal not theretofore widely prevalent or distributed within and throughout the State of Oregon, the commissioner at large of the State Board of Horticulture shall determine that it is necessary to forbid the importation of any class of nursery stock or of any other class of plants, fruits, vegetables, roots, bulbs, seeds or other plant products or of any articles which are naturally, or liable to be, the hosts of such injurious diseases, insects or animals, from country or locality where such disease or insect or animal infestation exists, he shall promulgate such determination, specifying the country and locality and the class of nursery stock or other article which in his judgment should be excluded. Following the promulgation of such determination by the commissioner at large of the State Board of Horticulture, and until the withdrawal of said promulgation by him, the importation into the State of Oregon of the article or articles specified in the said promulgation from any country or locality specified in the said promulgation is hereby prohibited; provided, that before such promulgation becomes effective the Governor of the State of Oregon shall approve such promulgation in writing thereon, and such promulgation so approved shall have been published in three newspapers designated by the Governor in writing. Whenever the commissioner at large of the State Board of Horticulture deems it for the best interest of the State of Oregon to withdraw such promulgation, he can do so with the written approval of the Governor of Oregon by publishing a notice of such withdrawal in three newspapers to be designated by the Governor. Proofs of publication of such promulgations and withdrawals of promulgations shall be filed in the office of the Secretary of State.

Section 2. The commissioner at large of the State Board of Horticulture is authorized and directed to quarantine any locality within the State of Oregon when he shall determine the fact that a dangerous plant disease or insect infestation new to or not theretofore widely prevalent or distributed within and throughout the State exists in such locality. The commissioner at large of the State Board of Horticulture shall publish a notice of such quarantine in such newspaper published within or near the quarantined locality as the Governor of Oregon may designate, and the quarantine shall be effective immediately upon the publication of such notice. Such notice must be approved in writing by the Governor before publication. From and after the publication of such notice it shall be unlawful for any person, firm or corporation to carry or transport any article or articles specified in the notice of quarantine from the quarantined locality into or through any other part of the State. Whenever it appears to the commissioner at large that such quarantine of such locality is no longer necessary, he shall give notice that such quarantine is no longer in force. Such notice shall be approved by the Governor in writing and shall be published in some newspaper within or near the quarantined locality to be designated by the Governor. Proofs of the publication of the notices provided for in this section shall be filed in the office of the Secretary of State.

Section 3. The State Board of Horticulture shall appoint a State inspector to hold office during the pleasure of the board. It shall be the special duty of the State inspector to inspect nursery stock, trees, shrubs, plants, fruits and vegetables and other articles mentioned in this act, coming from points without the State, and to enforce the provisions of this act and all other horticultural laws of the State relating thereto. He shall also have all the duties, powers and rights of a county inspector and is granted jurisdiction to act throughout the State. His salary shall be $1,200.00 per year and he shall be allowed the expenses necessarily incurred in the performance of his duties. His salary and necessary expenses shall be paid monthly in the same manner as the members of the State Board of Horticulture are paid from the funds appropriated for the said board; provided, that his monthly account shall be first approved in writing by the commissioner at large of the State Board of Horticulture. Before entering upon his duties, the State inspector shall make and subscribe an oath to support the Constitution of the United States and the State of Oregon, and to diligently, faithfully and impartially discharge the duties of his office. This oath shall be filed in the office of the Secretary of State.

Section 4. Any person, persons, firm or corporation who shall bring or cause to be brought into the State of Oregon, any nursery stock, trees, shrubs, plants, vines, cuttings, grass, scions, buds, fruit pits, or fruits or vegetables, shall immediately after the arrival thereof, notify the State inspector, if he be in the county in which such articles are received, of their arrival, and hold the same without unnecessarily moving the same or placing such articles where they may be harmful, for the immediate inspection of said State inspector or county inspector or other person authorized to make such inspection. If there is no State inspector in the county in which such article is received, it shall then be the duty of such person, firm or corporation to notify the county inspector of the county in which the article is received. If there is neither State inspector nor county inspector in the county in which such article is received then it shall be the duty of the person, firm or corporation, to notify the commissioner of the State Board of Horticulture for the district which includes said county who shall make immediate arrangement for the inspection of such article or articles. The commissioners of the State Board of Horticulture and their deputies, the secretary of the State Board of Horticulture, the state inspector, and the county inspectors and their deputies are hereby authorized and empowered to enter at any time into any car, warehouse, depot or upon any ship within the boundaries of the State of Oregon, whether in the stream or at the dock, wharf, mole, or any other place where such nursery stock or fruit, or vegetables, or seed, or other such articles are received, or in which any of such articles are imported into the state, for the purpose of making the investigation or examination to ascertain whether such articles are infested with any injurious insects or their eggs, larvae or pupae, or other animal or plant disease.

If, after such examination or inspection, any of said articles are found so infected or infested, then it shall be the duty of the owner, owners, or persons, firm or firms, or corporation having charge or possession thereof to so disinfect at his or their expense such portion or portions of the ship, dock, wharf, mole or car or warehouse or depot where such articles may have been located in such a manner as to destroy all infection or infestation present, and all articles apt to be so infested or infected shall be held until the said articles have been thoroughly disinfected and all injurious insects, or their eggs, larvae or pupae or other animal or plant diseases have been eradicated and destroyed; provided, however, that all articles of nursery stock, trees, shrubs, plants, vines, cuttings, grafts, scions, buds, fruit pits, fruits, vegetables or seed which are infested or infected with injurious insects or their eggs, larvae or pupae, or other animals, or with injurious plant disease liable to cause damage in this State, shall be destroyed or reshipped out of the State as hereinafter provided.

Section 5. When any shipment of nursery stock, trees, vines, plants, shrubs, cuttings, grafts, scions, buds, fruit pits, or fruits or vegetables or seed imported or brought into this State is found infested or infected with any injurious insects or their eggs, larvae or pupae or other animals or with any plant disease liable to be detrimental to orchards, vineyards, gardens or farms in Oregon, or any part thereof, and the nature of the animals or insects or diseases is such that there will not be danger of the escape or spread of such animals, insects or diseases if the infested or infected articles are promptly shipped out of the State, then the State inspector, county inspector or other person duly authorized to make inspection of such articles and who has made such inspection shall notify the owner, or persons, firm or corporation having possession or control of said articles to ship the same out of the State within a specified time, the limit of which shall be not less than forty-eight hours, nor more than ten days, according to the nature of the insects, or diseases, and it shall be the duty of such owner or owners, or persons, firm or corporation, to so ship said articles, but such shipment shall be made under the direction of the officer making the inspection and shall be at the expense of the owners, his or their agents; in case of a failure of the owner or owners or his or their agents to comply with the notice the said articles shall be destroyed by said officer at the expense of the said owner or owners, his or their agents. When any carload, case, box, package, bale or bundle of such articles is in part infected or infested and the nature of the infestation or infection is such that the portion of shipment which is not infested or infected can be separated from the portion which is infected or infested without danger of escape from the infested or infected articles of the insects, their eggs, larvae or pupae, or the animals, or the disease or diseases with which such articles are infested, and the owner or person, firm or corporation having control or possession of such articles desires to separate the portion not infested or infected from the portion which is infested or infected, the officer making the inspection shall give a permission in writing to make such separation within a time specified in such permission, which time shall be reasonable for the performance of the work, but with due regard to the safety of the State; such permission shall be granted only upon the condition that the owner or owners or his or their agents make such separation and destroy all the infested or infected portion at his or their own expense and under the supervision of the officer doing the inspection or of some person authorized by him to supervise the work of separation and destruction, and shall pay for the services of the person authorized to supervise such work when it is necessary for the officer making the inspection to authorize and depute some person to supervise such work. Whenever the official who makes such inspection has other official work awaiting and it appears that the time required for separating and destroying such articles may exceed one hour, he may authorize and depute some proper person to supervise the separation of the uninfested and uninfected articles from the infested or infected articles and the destruction of the infested or infected articles, and the person so authorized shall be paid for his services by the owner or owners or his or their agents for his services while supervising the separation and destruction of such articles. In case of the failure of the owner or owners, his or their agents to comply with the foregoing conditions within the time specified in the written permission, the contents of every such car, case, box, package, crate, bale or bundle containing articles infested or infected as aforesaid, shall be destroyed at the expense of the owner or owners, his or their agents.

When any shipment of any nursery stock, trees, vines, plants, shrubs, cuttings, scions, buds, fruit pits, seeds, fruits, vegetables or other articles brought into the State are infected or infested with any disease or insects or their eggs, larvae or pupae which are injurious to trees, plants, vines, shrubs, fruits, vegetables and other plant growths, and the nature of such infection or infestation is such that the shipment can not be reshipped out of the State without danger of damage to the orchards, vineyards, farms, gardens, and their productions, of Oregon, or to any of them, such shipment shall be immediately destroyed by the State inspector, county inspector or commissioner of the State Board of Horticulture, who shall have inspected the same, or under his direction.

Section 6. Each carload, case, box, package, crate, bundle, or bale of trees, shrubs, plants, vines, cuttings, grass, scions, buds, fruit pits, fruits or vegetables, imported or brought into this State shall have plainly and legibly marked thereon in a conspicuous manner and place, the name and address of the person, firm or corporation shipping the same, and the name and address of the consignee, also the name of the country, State or territory where the contents were grown and must show that it contains nursery stock, seedlings or seeds.

Section 7. No person, firm, or corporation shall bring or cause to be brought into the State of Oregon, any fruit or vegetable or host plant which is known to be, or hereafter may become a host plant or host fruit of any species of the fruit fly family, Trypetidae, from any country, State or district where such species of Trypetidae is known to exist and any such fruit, vegetable, or host plant, together with its container and packing shall be immediately destroyed at the expense of the owner or agent.

Section 8. No person, firm or corporation shall bring or cause to be brought into the State of Oregon any peach, nectarine, or apricot tree or cuttings, grafts, scions, buds, or pits of such trees, or any trees budded or grafted upon peach stock or roots, that have been in a district where the contagious disease known as "peach yellows," "little peach," and "peach rosette," or any one of them, are known to exist, and any such shipped into this State shall be destroyed or returned to the point of shipment at the option of the owner or agent and at his expense.

Section 9. Any nursery stock, trees, vines, plants, shrubs, cuttings, grafts, scions, buds, fruit pits, fruits, vegetables, or other articles infested with any species of injurious insects, or their eggs, larvae, or pupae, which would be liable to cause damage to the orchards, vineyards, farms and gardens and their products, or with any disease liable to spread to fruits, vegetables, trees, vines, plants, or any other useful product of the soil in Oregon, are hereby declared to be a public nuisance and the several commissioners of the State Board of Horticulture, the State inspector or the county inspector who inspects the same is invested with the power to abate the nuisance in a summary manner.

Section 10. Any person violating any of the provisions of this act shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be punished by a fine of not more than $100.00, or by imprisonment in the county jail for a period of not exceeding three months.

Section 11. The members and officers of the State Board of Horticulture and the State inspector and the county inspectors are authorized to collaborate with the Department of Agriculture of the United States in all matters relating to the inspection of nursery stock, plants, fruits, vegetables, bulbs, seeds or other plant products shipped into the State of Oregon from foreign countries or from other states or territories.

Section 12. Inasmuch as it is a matter of general knowledge that there now exists in portions of the States of Utah and Idaho a dangerous insect pest known as the alfalfa weevil, which does great damage to alfalfa, clover, vetch and similar forage plants, which pest is not known to have yet been introduced into the State of Oregon, but would cause a great amount of damage and loss to the farmers of this State if introduced, and there is imminent danger that this pest will be introduced in Oregon by means of hay brought into this State from the infected sections of the states mentioned, and existing laws make no provision by which quarantine can be established to prevent the introduction of this pest, and it is necessary for the immediate preservation of the public health, peace, safety and welfare that legal provision be made for establishing a quarantine against said pest, an emergency is hereby declared to exist and this act shall be exempt from the power of the referendum and shall take effect and be in full force from and after its approval by the Governor.

Section 13. All acts and parts of acts conflicting with the provisions of this act are hereby repealed.

Filed in the office of the Secretary of State, February 26, 1913.

PROHIBITING SALE OF MISBRANDED INSECTICIDES AND FUNGICIDES

(Chapter 205, Laws of 1911.)

Section 1. That it shall be unlawful for any person, or persons, firm or corporation, to manufacture within the State of Oregon, any insecticide, Paris green, lead arsenate, or fungicide which is adulterated or misbranded within the meaning of this act, for use or sale within or without the State of Oregon; and any person who shall violate any of the provisions of this section shall be guilty of a misdemeanor, and shall, upon conviction thereof, be fined not less than fifty dollars ($50.00) nor more than two hundred dollars ($200.00) for the first offense, and upon conviction for each subsequent offense be fined not less than one hundred dollars ($100.00) nor more than three hundred dollars ($300.00) or sentenced to imprisonment in the county jail for not less than thirty days nor more than ninety days for the first offense, and not less than ninety days for the second offense, upon conviction, nor more than six months, or both such fine and imprisonment, in the discretion of the court.

Section 2. That it shall be unlawful for any person or persons, firm or corporation, to sell, or offer for sale, within the State of Oregon, any insecticide, Paris green, lead arsenate, or fungicide which is adulterated or misbranded within the meaning of this act; and any person or persons, firm or corporation, who shall violate any of the provisions of this section shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be fined or imprisoned, or both, as is provided in Section 1 of this act.

Section 3. That the examination of specimens of insecticides, Paris green, lead arsenates, and fungicides shall be made by the chemist of the Oregon Agricultural College, at Corvallis, Oregon, or the State Board of Health, at Portland, Oregon, or by the chemist of the University of Oregon, at Eugene, Oregon, for the purpose of determining from such examination whether such article or articles are adulterated or misbranded within the meaning of this act; and if it shall appear from any such examination that any of such specimens are adulterated or misbranded within the meaning of this act, it shall be the duty of the prosecuting attorney within the district where the offense is committed to institute proper criminal proceedings against any person or persons, firm or corporation, so manufacturing, selling or offering for sale any such misbranded, adulterated or fraudulent article as set forth in Sections 1 and 2 of this act.

Section 4. That the term "insectcide" as used in this act shall include any substance or mixture of substances intended to be used for preventing, destroying, repelling, or mitigating any insects which may infest vegetation, man or other animals, or households, or be present in any environment whatsoever. The term "Paris green" as used in this act shall include the product sold in commerce as Paris green and chemically known as the aceto-arsenite of copper. The term "lead arsenate" as used in this act shall include the product or products sold in commerce as lead arsenate and consisting chemically of products derived from arsenic acid ($H3AsO4$) by replacing one or more hydrogen atoms by lead. That the term "fungicide" as used in this act shall include any substance or mixture of substances intended to be used for preventing, destroying, repelling, or mitigating any and all fungi that may infest vegetation or be present in any environment whatsoever.

Section 5. That for the purpose of this act an article shall be deemed to be adulterated—

In the case of Paris green: First, if it does not contain at least 50 per centum of arsenious oxide; second, if it contains arsenic in water-soluble forms equivalent to more than three and one-half per centum of arsenious oxide; third, if any substance has been mixed and packed with it so as to reduce or lower or injuriously affect its quality or strength.

In the case of lead arsenate: First, if it contains more than 50 per centum of water; second, if it contains total arsenic equivalent to less than 12 per centum of arsenic oxide ($As205$); third, if it contains arsenic in water-soluble forms equivalent to more than seventy-five one hundredths per centum of arsenic oxide ($As205$); fourth, if any substances have been mixed and packed with it so as to reduce, lower, or injuriously affect its quality or strength; provided, however, that extra water may be added to lead arsenate (as described in this paragraph) if the resulting mixture is labeled lead arsenate and water, the percentage of extra water being plainly and correctly stated on the label.

In the case of insecticides or fungicides, other than Paris green and lead arsenate: First, if its strength or purity fall below the professed standard or quality under which it is sold; second, if any substance has been substituted wholly or in part for the article; third, if any valuable constituent of the article has been wholly or in part abstracted; fourth, if it is intended for use on vegetation and shall contain any substances which, although preventing, destroying, repelling or mitigating insects, shall be injurious to such vegetation when used.

Section 6. That the term "misbranded" as used herein shall apply to all insecticides, Paris greens, lead arsenates, or fungicides, or articles which enter into the composition of insecticides or fungicides, the package or label of which shall bear any statement, design, or device regarding such article or the ingredients or substances contained therein which shall be false or misleading in any particular, and to all insecticides, Paris greens, lead arsenates, or fungicides which are falsely branded.

That for the purpose of this act an article shall be deemed to be misbranded—

In the case of insecticides, Paris greens, lead arsenates, and fungicides: First, if it be an imitation or offered for sale under the name of another article; second, if it be labeled or branded so as to deceive or mislead the purchaser, or if the contents of the package as originally put up shall have been removed in whole or in part and other contents shall have been placed in the package; third, if in package form, and the contents are stated in terms of weight or measure, they are not plainly and correctly stated on the outside of the package; fourth, if the label does not state the chemical formula of the compound or compounds which shall constitute the insecticide, Paris green, lead arsenate or fungicide, contained within the package.

In the case of insecticides (other than Paris greens and lead arsenates) and fungicides: First, if it contains arsenic in any of its combinations or in the elemental form and the total amount of arsenic present (expressed as per centum of metallic arsenic) is not stated on the label; second, if it contains arsenic in any of its combinations or in the elemental form and the amount of arsenic in water-soluble forms (expressed as per centum of metallic arsenic) is not stated on the label; third, if it consists partially or completely of an inert substance or substances which do not prevent, destroy, repel, or mitigate insects or fungi and does not have the names and percentage amounts of each and every one of such inert ingredients plainly and correctly stated on the label.

Section 7. No license or other qualification shall be required to enable any and all persons to engage in the sale and disposal of any of the above named insecticides, fungicides or any other fungus or insect destroying, preventing or repelling poisons, agents or preparations.

Section 8. That Sections 5497 and 5498 of Lord's Oregon Laws be and are hereby repealed. [Chap. 205, L. 1911.]

REGULATING SALE OF LIME-SULPHUR SOLUTION

(Chapter 146, Laws of 1911.)

Section 1. No person, firm or corporation shall sell, offer, or expose for sale, any lime and sulphur solution or compound for spraying purposes, which shall have a specific gravity of less than 30 degrees, Beaume test, or which contains anything except products which arise from boiling lime and sulphur in water, and no salt or other soluble substance shall be used therein.

Section 2. Every package of such compound or solution sold, offered, or exposed for sale shall be plainly labeled with black-faced type, in letters of not less than one-half of an inch in height, stating the contents of the compound or solution and the gravity test thereof.

Section 3. Any person, firm or corporation selling, offering or exposing for sale any lime and sulphur solution or compound which does not comply with the provisions of this act, either as to test, ingredients, label or otherwise, shall be deemed guilty of a misdemeanor and upon conviction thereof shall be fined not less than $10.00 nor more than $100.00, or by imprisonment in the county jail not more than sixty days, or by both such fine and imprisonment, in the discretion of the court.

Section 4. In view of the fact that this act is necessary to the public peace, safety and welfare, and because the spraying season will be over in less than ninety (90) days, an emergency is hereby declared to exist and this act shall exist from and after its approval by the Governor. [Chap. 146, L. 1911.]

ESTABLISHING STANDARD SIZES OF APPLE BOXES

(Chapter 123, Laws of 1911.)

Be It Enacted by the People of the State of Oregon:

Section 1. There is hereby created and established a standard size for apple boxes for the State of Oregon.

Section 2. The standard size of an apple box shall be eighteen inches long, eleven and one-half inches wide, ten and one-half inches deep, inside measurement.

Section 3. That the special size of apple boxes shall be twenty inches long, eleven inches wide, and ten inches deep, inside measurement.

Notice of Quarantine No. 1, Promulgation Relating to Alfalfa Weevil

It is a matter of common knowledge that an injurious insect pest, the alfalfa weevil (phytonomus posticus) exists in the States of Utah and Wyoming and in that portion of the State of Idaho, hereinafter described, which insect pest is not yet prevalent nor yet found within the State of Oregon, but which, if introduced, would cause great loss to growers of alfalfa, clover and similar plants, and it has been determined by the commissioner at large of the Oregon State Board of Horticulture that it is necessary to prohibit the importation into the State of Oregon from the infested States and portion of a State of all articles which are naturally, or are liable to be, the host of said alfalfa weevil:

Now, therefore, I, Wilbur K. Newell, commissioner at large of the Oregon State Board of Horticulture, do hereby declare that in order to prevent the introduction of said alfalfa weevil into Oregon it is necessary to prohibit the importation into the State of Oregon from the States of Utah and Wyoming and from that portion of the State of Idaho bounded on the north by the 43d parallel north latitude, on the east by the State of Wyoming, on the south by the State of Utah, on the west by the 113th meridian west longitude and on the northwest by the Snake River, of all kinds of hay and straw, including hay, straw, grass, forage plants, weeds or tule used in cattle care or used for packing nursery stock of any kind, or in connection with hives of bees, or in any other way, and of alfalfa seed, and hereafter and until further notice such importations from the States of Utah and Wyoming and the hereinbefore described portion of Idaho is prohibited.

Done at the office of the Oregon State Board of Horticulture, Portland, Oregon, March 6, 1913.

WILBUR K. NEWELL,
Commissioner at Large of the Oregon State Board of Horticulture.

Approved: OSWALD WEST,
Governor of the State of Oregon, Salem, Oregon.

POWDERY SCAB

In the early part of the year 1915, the fact was definitely established that the potato disease known as the Powdery Scab of Potatoes had established itself in Tillamook County in this state. This disease had not previously been found in Oregon and was not known in any other county in the State. The State Board of Horticulture was advised by the Federal Horticultural Board of the United States Department of Agriculture that the disease was a dangerous one and for the protection of the potato industry in other portions of the State the following quarantine was established:

Oregon State Board of Horticulture, Notice of Quarantine No. 2

The fact has been determined by the president of the Oregon State Board of Horticulture that a dangerous potato disease known as the Powdery Scab of Potatoes (Spongospora subterranea), new to and not heretofore widely prevalent or distributed within and throughout the State of Oregon, exists in the County of Tillamook in the State of Oregon:

Now, therefore, I, Chas. A. Park, president of the Oregon State Board of Horticulture, under the authority conferred by Section 2, of Chapter 246 of the General Laws of 1915, and Section 4, of Chapter 342 of the General Laws of 1915, do hereby quarantine the said County of Tillamook, and from and after the publication of this notice in a newspaper published within said County of Tillamook, it shall be unlawful for any person, firm or corporation to carry or transport any common potato or potatoes from the said County of Tillamook into or through any part of the State of Oregon, outside of said County of Tillamook.

Done at Salem, Oregon, July 13, 1915. CHAS. A. PARK,
President of the Oregon State Board of Horticulture.

Executive Office, Salem, Oregon, July 13, 1915.

I, James Withycombe, Governor of the State of Oregon, do hereby approve the foregoing notice of quarantine and designate the Tillamook Headlight, a newspaper published in said County of Tillamook, as the newspaper in which said notice shall be published.

JAMES WITHYCOMBE,
Governor of the State of Oregon.

Recent reports of the investigations of the Federal Horticultural Board lead me to believe that this quarantine against the shipment of potatoes from Tillamook County may soon be annulled without serious detriment to the potato industry of the State.

California Tuber Moth of the Potato

For several years past, there have been shipped to Oregon from outside states potatoes which were infested with tuber moth. Since Oregon was free from this pest, and the introduction of tuber moth into this State would cause a great economic loss to the potato growers, it was found necessary to issue two quarantine regulations. These regulations were issued after the most careful consideration of the matter of protecting our own people from a new and serious pest, and were not promulgated from any spirit of animosity. Since the declaration of the quarantine, there has been no cause for complaint against any shipment of potatoes which came into this State with the certificate of the California inspector. The quarantine regulations as above referred to, are herewith set out in full:

Oregon State Board of Horticulture, Notice of Quarantine No. 3

The fact has been determined by the president of the Oregon State Board of Horticulture that a dangerous insect pest, injurious to the common potato, which is commonly known as the potato tuber moth or potato tuber worm (Pythorimoea operculella, Zell.), new to and not heretofore prevalent or widely distributed within and throughout the State of Oregon, exists and is widespread in the State of California, and that, to prevent the introduction and spread of said pest in the State of Oregon, it is necessary to forbid the importation of potatoes from California except under the conditions hereinafter set forth:

Now, therefore, I, Chas. A. Park, president of the Oregon State Board of Horticulture, under the authority conferred by Section 1 of Chapter 246 of the General Laws of Oregon of 1913, and Section 4 of Chapter 342 of the General Laws of Oregon of 1915, do hereby prohibit the importation of any common potato or potatoes from the State of California into the State of Oregon, except under the conditions hereinafter specified, and from and after the publication of this notice in three newspapers published in the State of Oregon it shall be unlawful for any person, firm or corporation to transport or bring any common potatoes from the State of California into the State of Oregon except under the following conditions:

1. Every shipment of common potatoes from the State of California to the State of Oregon must be accompanied by a certificate of inspection signed by a county horticultural commissioner or other duly authorized horticultural inspector of said State of California, certifying that he has inspected the potatoes in said shipment and found them free from the potato tuber moth, its larva or pupa. Such certificate shall be signed in writing and shall specify the locality where said potatoes are grown; the date of inspection, and the number of sacks, boxes or other containers included in the shipment inspected.

2. Every shipment of potatoes grown in California which is brought into Oregon must be brought to the city of Portland, and must be held at the wharf, dock, railroad yards, freight depot or express company's depot or office of the common carrier bringing such potatoes into the State until said potatoes have been inspected by the State Inspector of the Oregon State Board of Horticulture or by some other duly authorized inspector working under direction of the said State Board of Horticulture, and permission has been given by the inspector making such inspection to deliver the potatoes. The common carrier, person, firm or corporation bringing potatoes into Oregon which are grown in California must notify the State Board of Horticulture or the State inspector of said board of the arrival in Portland of such potatoes and hold the shipment as hereinbefore provided.

3. If, upon inspection, any of the potatoes in any shipment are found to be infested with the potato tuber moth, its larva or pupa, or show indications that they have been so infested, the person, firm, or corporation who has brought said shipment of potatoes from California to this State must take said shipment of potatoes back to California within four days from the date of inspection of said potatoes in Portland, provided that if the infestation shall be in such condition that the inspector believes there would be danger of escape of the

potato tuber moth from the shipment in course of transit through the State, the person, firm or corporation bringing the shipment into the State will be required to destroy the shipment, including the containers, by burning the same.

Done at Salem, Oregon, this twentieth day of January, 1916.

CHAS. A. PARK,
President of the Oregon State Board of Horticulture.

I, James Withycombe, Governor of the State of Oregon, do hereby approve the foregoing promulgation.

JAMES WITHYCOMBE,
Governor of the State of Oregon.

The foregoing regulations have been modified so as to permit the bringing of potatoes grown in California to the following additional points in Oregon for inspection: Astoria, Salem, Eugene, Roseburg, Medford, Klamath Falls, Lakeview.

White Pine Blister Rust

Within the past few years a disease known as the White Pine Blister Rust has established itself in the eastern portion of the United States where is is doing great damage to all five-leafed pines. Oregon's forests of five-leafed pines, including the western white pine and the sugar pine, are of immense value. For the protection of these forests it appeared necessary to prohibit the importation of five-leafed pines from any locality not known to be free from this disease. It was necessary to include in this prohibition all varieties of currant and gooseberry bushes, as they are subject to the disease. The following quarantine was therefore established:

Oregon State Board of Horticulture, Notice of Quarantine No. 4

The fact has been determined by the president of the Oregon State Board of Horticulture that a dangerous disease of pine trees, known as the White Pine Blister Rust (Peridermium strobi, Klebahn), not heretofore prevalent in nor distributed within the State of Oregon, exists in many foreign countries and throughout a large portion of the United States east of the Mississippi River, which disease attacks all five-leafed pines and all currant and gooseberry plants:

Now, therefore, I, Chas. A. Park, president of the Oregon State Board of Horticulture, under authority conferred by Section 1, of Chapter 246, of the General Laws of 1913, do hereby prohibit the importation from any and all foreign countries and from all portions of the United States east of the Mississippi River, of all trees of five-leafed pines and of all species and genera of currant and gooseberry plants and cuttings.

The best known five-leafed pines are Pinus strobus, white pine; P. monticola, Western white pine; P. lambertina, sugar pine; P. flexilis, limber pine; P. albicaulis, white-bark pine; P. strobiformi, Mexican white pine; P. balfourina, foxtail pine; P. aristata, bristlecone pine;

P. cembroides, pinon pine; P. excelsa, Himalayan pine; P. Pence, Balkan pine; P. armanda, Chinese white pine; P. parviflora, Japanese white pine; P. cembra, stone pine; P. koriensis, Korean pine.

Done at Salem, Oregon, this 24th day of July, 1916.

CHAS. A. PARK,
President of the Oregon State Board of Horticulture.

I, James Withycombe, Governor of the State of Oregon, do hereby approve the foreging promulgation.

JAMES WITHYCOMBE,
Governor of the State of Oregon.

Executive Office, Salem, Oregon, July 24, 1916.

CHAS, A. PARK,
President and Commissioner for Second District.

Salem, Oregon, December 30, 1916.

United States Department of Agriculture, Notice of Quarantine No. 26

The fact has been determined by the Secretary of Agriculture that it is necessary, in order to prevent the further spread of a dangerous plant disease known as the White Pine Blister Rust (Peridermium strobi Kleb.), not heretofore widely prevalent or distributed within and throughout the United States, to quarantine all States east of and including the States of Minnesota, Iowa, Missouri, Arkansas and Louisiana.

Now, therefore, I, David F. Houston, Secretary of Agriculture, under the authority conferred by Section 8 of the Plant Quarantine Act of August 20, 1912 (37 Stat., 315), as amended by the Act of Congress approved March 4, 1917 (Public No. 390, 64th Congress), do hereby quarantine all the States east of and including the States of Minnesota, Iowa, Missouri, Arkansas and Louisiana, and by this Notice of Quarantine No. 26 do order that no five-leafed pines, or currant or gooseberry plants (Ribes and Grossularia) shall be moved or allowed to move interstate to points outside the quarantined area; and, further, that no five-leafed pines or black currant plants shall be moved or allowed to move interstate to points outside the area comprising the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut and New York.

Restrictions now or hereafter enforced by any State on the entry into such State of the plants named in this quarantine are in no wise affected by this quarantine.

This quarantine shall not apply to the movement by the United States Department of Agriculture of the plants named for experimental or scientific purposes.

This notice of quarantine shall become and be effective on and after June 1, 1917.

Done at Washington this 21st day of April, 1917.

Witness my hand and the seal of the United States Department of Agriculture.

D. F. HOUSTON,
Secretary of Agriculture.

United States Department of Agriculture, Amendment No. 1 to Notice of Quarantine No. 26

The fact has been determined by the Secretary of Agriculture that it is necessary, in order to prevent the further spread of a dangerous plant disease known as the White Pine Blister Rust (Peridermium strobi Kleb.), not heretofore widely prevalent or distributed within and throughout the United States, to quarantine immediately the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut.

Now, therefore, I, David F. Houston, Secretary of Agriculture, under the authority conferred by Section 8 of the Plant Quarantine Act of August 20, 1912 (37 Stat., 315), as amended by the act of Congress approved March 4, 1917 (Public No. 390, 64th Cong.), do hereby amend Notice of Quarantine No. 26, promulgated April 21, 1917, effective on and after June 1, 1917, and by this amendment do order that from and after the date hereof no five-leafed pines or black currant plants shall be moved or allowed to move interstate to points outside the area comprising the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut.

Done at Washington this 1st day of May, 1917.

Witness my hand and the seal of the United States Department of Agriculture.

D. F. HOUSTON,
Secretary of Agriculture.

United States Department of Agriculture, Notice of Quarantine No. 37, With Regulations

Quarantine No. 37 with regulations, governing the entry of nursery stock and other plants and seeds, supersedes, on and after June 1, 1919, the regulations now in force governing the importation of nursery stock, and brings under restrictions all other plants and plant products for or capable of propagation.

Regulation 2 under this quarantine provides that fruits, vegetables, cereals and other plant products for or capable of propagation, intended for medicinal, food or manufacturing purposes and field, vegetable and flower seeds, may be imported without permit or other restrictions.

Regulation 3 enumerates the classes of plants which may be imported for propagation under permit and on compliance with the other requirements of the regulations. These classess comprise certain bulbs, rose stocks, fruit stocks, including cuttings, scions and buds, and seeds of nut, fruit, forest and other ornamental and shade trees and of hardy perennial ornamental shrubs. The entry of these classes of nursery stock and other plants and seeds is represented by experts to be essential to the floriculture and horticulture of this country under existing conditions.

The entry of plants or classes of plants or plant products for or capable of propagation, not specifically provided for in regulations 2 and 3, from any foreign locality or country is restricted to importations by the United States Department of Agriculture for experimental or scientific purposes.

This quarantine does not affect the status of nursery stock and other plants and seeds covered by special quarantines and other restrictive orders now in force.

The regulations governing the entry of the classes of plants listed in regulation 3 are similar to those hitherto in force and take into account the classification of countries into (1) those maintaining inspection and certification of nursery stock in accordance with the requirements of the plant quarantine act, and (2) countries which have not made provision for such compliance with the act. (See Appendix C.)

C. L. MARLATT,
Chairman, Federal Horticultural Board.

United States Department of Agriculture, Notice of Quarantine No. 37

The fact has been determined by the Secretary of Agriculture, and notice is hereby given, that there exist in Europe, Asia, Africa, Mexico, Central and South America, and other foreign countries and localities, certain injurious insects and fungous diseases new to and not heretofore widely distributed within and throughout the United States, which affect and are carried by nursery stock and other plants and seeds, the words "nursery stock and other plants and seeds" including, wherever used in this notice and the rules and regulations supplemental hereto, field grown florists' stock, trees, shrubs, vines, cuttings, grafts, scions, buds, fruit pits and other seeds of fruit and ornamental trees or shrubs, also field, vegetable and flower seeds, bedding plants, and other herbaceous plants, bulks and roots, and other plants and plant products for, or capable of, propagation.

Now, therefore, I, D. F. Houston, Secretary of Agriculture, under the authority conferred by the act of Congress approved August 20, 1912 (37 Stat., 315), do hereby declare that it is necessary, in order to prevent the further introduction into the United States of injurious insect pests and fungous diseases, to forbid, except as provided in the rules and regulations supplemental hereto, the importation into the United States of nursery stock and other plants and seeds from the foreign countries and localities named and from any other foreign locality or country.

On and after June 1, 1919, and until further notice, by virtue of said act of Congress approved August 20, 1912, the importation of nursery stock and other plants and seeds from the above named and all other foreign countires and localities, except as provided in the rules and regulations supplemental hereto, is prohibited.

This quarantine shall not apply to nursery stock and other plants and seeds covered by special quarantines and other restrictive orders now in force, a list of which is given in Appendix A of the rules and regulations supplemental hereto, nor to the importation by the United States Department of Agriculture of nursery stock and other plants and seeds for experimental or scientific purposes.

Done in the District of Columbia this 18th day of November, 1918.

Witness my hand and the seal of the United States Department of Agriculture.

D. F. HOUSTON,
Secretary of Agriculture.

Rules and Regulations Supplemental to Notice of Quarantine No. 37 Governing the Importation of Nursery Stock and Other Plants and Seeds Into the United States.

(Effective on and after June 1, 1919, and superseding the regulations heretofore issued governing the importation of nursery stock.)

Regulation 1. Definition. The words "nursery stock and other plants and seeds" are used throughout these rules and regulations in the same sense as in Notice of Quarantine No. 37.

Regulation 2. Nursery Stock and Other Plants and Seeds for Which Permit Is Not Required. The following classes of nursery stock and other plants and seeds, not including, however, the particular nursery stock and other plants and seeds named in Appendix A, which are governed by special quarantines and other restrictive orders now in force, nor such as may hereafter be made the subject of special quarantines, may be imported without permit or other compliance with these regulations:

(1) Fruits, vegetables, cereals, and other plant products imported for medicinal, food or manufacturing purposes.

(2) Field, vegetable and flower seeds.

Regulation 3. Nursery Stock and Other Plants and Seeds for Which Permit Is Required. The following nursery stock and other plants and seeds, not including, however, those named in Appendix A, which are governed by special quarantines and other restrictive orders now in force, nor such as may hereafter be made the subject of special quarantines, when free from sand, soil or earth, may be imported from countries which maintain inspection (see Appendix C), under permit upon compliance with these regulations, but, where a particular purpose is specified, for that purpose and no other:

(1) Lily bulbs, lily of the valley, narcissus, hyacinths, tulips and crocus.

(2) Stocks, cuttings, scions and buds, of fruits for propagation.

(3) Rose stocks for propagation, including Manetti, Multiflora, Brier Rose and Rosa Rugosa.

(4) Nuts, including palm seeds, for propagation.

(5) Seeds of fruit, forest, ornamental and shade trees, seeds of deciduous and evergreen ornamental shrubs and seeds of hardy perennial plants.

Importations of nursery stock and other plants and seeds specified in this regulation, from countries not maintaining inspection, may be made under permit upon compliance with these regulations in limited quantities for experimental purposes only, but this limitation shall not apply to tree seeds.

Regulation 4. Application for Permits for Importation of Nursery Stock and Other Plants and Seeds. Persons contemplating the importation of nursery stock and other plants and seeds* the entry of which is permitted under Regulation 3 shall first make application to the Federal Horticultural Board for a permit, stating in the application the exact designation of the nursery stock and other plants and seeds to be imported, the name and address of the exporter, the country and locality where grown, the port of entry, and the name and address of the importer in the United States to whom the permit should be sent.

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* A postoffice order dated May 27, 1913, as amended December 16, 1913, prohibits the importation by mail of all growing or living plants, seeds and other plant products for propagation, except field, vegetable and flower seeds.

Applications for permits should be made in advance of the proposed shipments, but if, through no fault of the importer a shipment should arrive before a permit is received the importation will be held in customs custody at the risk and expense of the importer for a period not exceeding twenty days pending the receipt of the permit.

Applications may be made by telegraph, in which case the information required above must be given.

Permits are not required for nursery stock and other plants and seeds, not under quarantine or regulation, entering the United States for immediate transportation in bond to foreign countries.

Applications for permits to import nursery stock and other plants and seeds from countries which do not maintain inspection must contain a definite statement of the quantity to be imported.

Regulation 5. Delivery in Bond Pending Receipt of Permit Will Be Allowed for Shipments From Countries Maintaining Inspection. If the required permit be not at hand upon arrival of a shipment from a country which maintains inspection, and such shipment meets the requirements of Regulations 7 and 8, it may be delivered to the importer, consignee or agent for the proper care thereof upon the filing of a bond with approved sureties in double the invoice value (but in no case less than $20.00), the condition of which shall be that the importation shall not be removed from the port of entry but shall be redelivered to the collector of customs within twenty days from the date of arrival at the port, unless in the meantime the collector is presented with a proper permit; or, if the importer, consignee or agent shall so elect, the goods may, so far as the Department of Agriculture is concerned, be retained in customs custody for a period not exceeding twenty days, pending the issuance of the permit, wholly at the risk and expense of the importer.

Regulation 6. Issuance of Permits. On approval by the Secretary of Agriculture of an application for the importation of nursery stock and other plants and seeds a permit will be issued in quadruplicate. One copy will be furnished to the applicant for presentation to the customs officer at the port of entry, one copy will be mailed to the collector of customs and one to the inspector of the Department of Agriculture at the port of entry, and the fourth will be filed with the application.

Permits shall be valid until revoked unless otherwise specified therein and will be issued for the ports of Boston, New York, Newark, San Francisco, Seattle, and such other ports as may from time to time be approved by the Federal Horticultural Board. The permit will be addressed to the collector of customs at the port for which it is issued.

Regulation 7. Inspection, Certification and Marking as a Condition of Entry. The importation of nursery stock and other plants and seeds from countries which maintain inspection will not be allowed unless the invoice is accompanied by an original certificate, and unless each container bears a copy certificate, issued by a duly authorized official of the country from which it is exported, stating that the nursery stock and other plants and seeds covered by the certificate have been thoroughly inspected by him or under his direction and found, or believed to be, free from injurious plant diseases and insect pests. Nursery stock and other plants and seeds exported between October 1 and May 31 shall be inspected on or after the 1st of October, and those exported between June 1 and September 30 shall be inspected at the time of packing; provided, that for tropical and semitropical countries, or for stock grown under glass, the inspection shall be at time of packing throughout the entire year.

Nursery stock and other plants and seeds from countries which do not maintain inspection shall not be delivered to the importer or consignee until they have been examined by an inspector of the Department of Agriculture and found to be free from plant diseases and insect pests, or, if infested, capable in the judgment of the inspector of being adequately safeguarded by disinfection. All importations under this paragraph must also comply with the disinfection requirement of Regulation 9. Nursery stock and other plants and seeds inspected as provided herein, which are found to be carrying any plant disease or insect pest, and which, in the judgment of the inspector can not be cleaned by disinfection or treatment, shall be refused entry. All charges for storage, cartage and labor incident to inspection and disinfection, other than the services of the inspector, shall be paid by the importer.

If a package of nursery stock and other plants and seeds offered for entry includes any prohibited article, the entire package will be refused entry.

Each case, box or other container or covering of nursery stock and other plants and seeds offered for entry shall be plainly and correctly marked to show the number of the permit, the general nature and quantity of the contents, the district or locality and country where grown, the name and address of the exporter, and the name and address of the consignee.

Regulation 8. Foreign Certificate of Inspection. Each certificate and copy certificate shall give the date of inspection; name of the grower or exporter; the district or locality and the country where grown; and a statement that the nursery stock and other plants and seeds have been inspected by a duly authorized official and found, or believed to be, free from insect pests and plant diseases. The original certificate shall be signed and sealed by, and the copy certificate shall bear the seal of, a responsible inspection official for the country of origin.

Lists of officials in foreign countries authorized to inspect nursery stock and other plants and seeds, giving their names and official designations, will be furnished to collectors of customs through the Secretary of the Treasury.

Regulation 9. Disinfection a Condition of Entry. Nursery stock and other plants and seeds imported under Regulation 3 shall be subject, as a condition of entry, to such disinfection as shall be required by the inspector of the Department of Agriculture. When disinfection is required, the nursery stock and other plants and seeds involved will be delivered to the permittee for disinfection upon the filing with the collector of customs of a bond in the amount of $5,000.00, or in an amount equal to the invoice value if such value be less than $5,000.00, with approved sureties, the condition of which shall be that the nursery stock and other plants and seeds shall be disinfected under the supervision of an inspector of the Department of Agriculture; that no case or other container thereof shall be broken, opened or removed from the port of entry unless and until a written notice is given to such collector by an inspector of the Department of Agriculture that the nursery stock and other plants and seeds have been properly disinfected; and that the importation shall be redelivered to the collector of customs within 40 days from arrival at the port of entry.

Regulation 10. Notice of Arrival by Permittee. Immediately upon arrival of the nursery stock and other plants and seeds at the port of entry, the permittee shall submit in duplicate notice to the Secretary of Agriculture, through the collector of customs, on forms provided for that purpose, stating the number of the permit, date of entry, name of ship or vessel, the country and locality where grown, name of the foreign shipper, number of cases and marks and numbers on cases, the general nature and quantity of the nursery and other plants and seeds, the port of entry, and the name of the importer or broker at the port of entry.

Regulation 11. Notice of Shipment by Permittee. After entry of the nursery stock and other plants and seeds and before removal from the port of entry for each separate shipment or consignment thereof the permittee shall notify the Secretary of Agriculture in duplicate, on forms provided for that purpose, stating the number of the permit, the date of entry, the port of entry, the customs entry number, name and address of the consignee to whom it is proposed to forward the shipment, the general nature and quantity of the nursery stock and other plants and seeds, the number of cases or other containers included in the shipment, and the case or container numbers and marks, together with the probable date of delivery for and route of transportation. A separate report is required for each ultimate consignee.

At the same time a copy of the notice to the Secretary of Agriculture shall be sent by the permittee to the duly authorized inspector or other officer of the state, territory, or district to which the nursery stock and other plants and seeds are to be shipped. A list of such inspectors and officers is appended.

Should a consignee named in such a notice ship or deliver for shipment to any other State, territory, or district such nursery stock and other plants or seeds before they have been inspected by a duly authorized State, territorial, or district inspector or officer, he shall, prior to such shipment, give like notices to the Secretary of Agriculture and to the duly authorized inspector or other officer of the State, territory, or district to which the nursery stock and other plants and seeds are to be reshipped.

Nursery stock and other plants and seeds which have been once inspected and passed by a duly authorized State, territorial, or district inspector or other officer, will be allowed to move interstate without restrictions other than those imposed on the interstate movement of domestic nursery stock.

Regulation 12. Marking a Condition of Interstate Shipment of Nursery Stock and Other Plants and Seeds Not Inspected. No person shall ship or deliver for shipment from one State, territory, or district of the United States into any other State, territory, or district any imported nursery stock and other plants and seeds the case, box, package, crate, bale, or bundle whereof is not plainly marked so as to show the general nature and quantity of the contents, the name and address of the consignee, and the country and locality where grown, unless and until such imported nursery stock and other plants and seeds have been inspected and passed by the proper official of a State, territory, or district of the United States.

Regulation 13. Cancelation of Permits for Violation of Regulations. Permits may be canceled and further permits refused for the importation of the products of any grower or exporter who has violated the Plant Quarantine Act or any rules and regulations promulgated thereunder, or for the importation of the products of any country whose inspection is found by the Federal Horticultural Board as the result of its examinations of importations therefrom to be merely perfunctory, or for the failure of a permittee to give any notice required by these rules and regulations, or for the giving of a false or incomplete notice or the mislabeling of any shipment with intent to evade any provision of the Plant Quarantine Act or any rules and regulations thereunder.

Regulation 14. These regulations shall not apply to the importation by the United States Department of Agriculture of nursery stock and other plants and seeds for experimental or scientific purposes.

The above rules and regulations are hereby adopted and shall be effective on and after June 1, 1919, and shall supersede the rules and regulations governing the importation of nursery stock into the United States, which were promulgated to take effect on and after July 1, 1916.

D. F. HOUSTON,
November 18, 1918. Secretary of Agriculture.

APPENDIX A

The entry of the following plants and plant products is prohibited or restricted by specific quarantines and other restrictive orders now in force:

(*a*) Irish potatoes from all countries except the Dominion of Canada and Bermuda. Irish potatoes may be imported from any foreign country into the Territories of Hawaii and Porto Rico, for local use only, free from any restrictions under the Plant Quarantine Act.

(*b*) Oranges, sweet limes, grapefruit, mangoes, achras sapotes, peaches, guavas, and plums from the Republic of Mexico.

(*c*) All five-leafed pines and all species and varieties of the genera ***Ribes*** and *Grossularia*, from each and every country of Europe and Asia and from the Dominion of Canada and Newfoundland.

(*d*) Cotton seed (including seed cotton) of all species and varieties, and cottonseed hulls, from any foreign locality and country.

(*e*) Seeds of the avocado or alligator pear from Mexico and the cuntries of Central America.

(*f*) Living canes of sugar cane or cuttings or parts thereof from all foreign countries. There are no Federal restrictions on the entry of such materials into Hawaii and Porto Rico.

(*g*) All citrus nursery stock including buds, scions, and seeds, from all foreign localities and countries.

(*h*) All pines not included in paragraph (*c*) from all European countries and localities.

(*i*) Seed and all other portions in the raw or unmanufactured state of Indian corn or maize (*Zea mays* L.), and the closely related plants, including all species of Teosinte (*Euchlaena*), Job's tears (*Coix*), *Polytoca, Chionachne,* and *Sclerachne*, from southeastern Asia (including India, Siam, Indo-China, and China), Malayan Archipelago, Australia, New Zealand, Oceania, Philippine Islands, Formosa, Japan, and adjacent islands.

(*j*) All species and varieties of citrus fruits from eastern and southeastern Asia (including India, Siam, Indo-China, and China), the Malayan Archipelago, the Philippine Islands, Oceania, (except Australia, Tasmania, and New Zealand), Japan (including Formosa and other islands adjacent to Japan), and the Union of South Africa.

(*k*) All varieties of sweet potatoes and yams (*Ipomoea batatas* and *Dioscorea* spp.) from all foreign countries and localities.

(*l*) All species or varieties of banana plants (*Musa* spp.) from all foreign countries and localities.

(*m*) Fruits of the avocado or alligator pear and avocado nursery stock less than 18 months of age from Mexico and the countries of Central America.

(*n*) Cotton from all foreign countries and localities.

(*o*) Cottonseed oil from Mexico and cottonseed cake, meal, and all other cottonseed products, except oil, from all foreign countries.

(*p*) All varieties of bamboo seed, plants, or cuttings thereof, capable of propagation, including all genera and species of the tribe *Bambuseae,* from all foerign countries.

APPENDIX B

FORMS REQUIRED BY THE FOREGOING REGULATIONS.

[These will be furnished on application.]

UNITED STATES DEPARTMENT OF AGRICULTURE

FEDERAL HORTICULTURAL BOARD,
WASHINGTON, D. C.

Application for permit to import nursery stock and other plants and seeds.

...., 19.......

To the Federal Horticultural Board, Washington, D. C.

Sirs: A permit is requested for the importation of the following nursery stock and other plants and seeds:

Exact designation of nursery stock and other plants and seeds to be imported. (If from a country which does not maintain inspection the exact quantity to be imported must be given.)

....

....

....

....

....

....

Name and address of exporter..

Country where grown..

Locality where grown..

Port of entry..

Name and address of person (either applicant or his agent or broker) to whom permit should be mailed..

Very respectfully,

....
(Name of applicant)

....
(Address)

UNITED STATES DEPARTMENT OF AGRICULTURE

FEDERAL HORTICULTURAL BOARD,
WASHINGTON, D. C.

Permit to import nursery stock and other plants and seeds
(Valid until revoked)

...., 19........

To the Collector of Customs..

You are hereby authorized, so far as the jurisdiction of the Department of Agriculture is concerned, to permit the entry under the plant quarantine act, approved August 20, 1912, of the nursery stock and other plants and seeds described below, in accordance with the rules and regulations supplemental to notice of quarantine No. 37 governing the importation of nursery stock and other plants and seeds into the United States, effective on and after June 1, 1919.

Exact designation of nursery stock and other plants and seeds to be imported.

....

....

....

....

....

Name and address of exporter..
Country and locality where grown..
Name and address of importer..

....

Respectfully,
D. F. HOUSTON, *Secretary of Agriculture.*

Countersigned:

....
Chairman of board.

....
In charge of entry of plants and plant products under restriction.

Customs Entry No......................

Importer's or broker's report of arrival of nursery stock and other plants and seeds.

In accordance with Section 2 of the plant quarantine act of August 20, 1912, and Regulation 10 of the rules and regulations supplemental to notice of quarantine No. 37 governing the importation of nursery stock and other plants and seeds into the United States, approved November 18, 1918, the information provided for in this blank must be given to the Secretary of Agriculture, Washington, D. C., through the collector of customs where entry is made, immediately upon arrival of the nursery stock and other plants and seeds at the port of entry.

D. F. HOUSTON, *Secretary of Agriculture.*

...., ..., 19.......
(Port of entry.)

THE FEDERAL HORTICULTURAL BOARD, *Washington, D. C.*

The following nursery stock and other plants and seeds imported under permit No...................... shipped from.., and consigned to ....arrived................................, 19........, on
(Name of importer or broker at port of entry.)
....dock or..
(Name of vessel or steamship line.)

....
(Name of railroad company.)

Country and locality where grown..
Foreign shipper...
No. of cases.......................................Marks and numbers on cases............................

....

Quantity
Kinds of Nursery Stock and Other Plants and Seeds
Compared with invoice and found correct, except as noted.

....
(Importer or broker at port of entry.)

....
(Deputy collector.)

....
(Address.)

Fumigation plant............

Importer's or broker's notice of shipment of nursery stock and other plants and seeds.

...., 19.......

THE FEDERAL HORTICULTURAL BOARD, *Washington, D. C.*

The nursery stock and other plants and seeds described below, imported under permit No................. entered at the port of...................., ..., 19...., per steamship.................................., are proposed to be shipped to...............................
(Name of consignee.)
at................................, on or about..............................., 19........, via..............................
(Address.)

....
(Name of railroad or steamship line.)

No. of cases.................................... Marks and numbers on cases...............................

....

Quantity.
Kinds of Nursery Stock and Other Plants and Seeds
(The above information is required in the case of each separate shipment.)

....,
(Name of importer or broker.)

....
(Address.)

Customs Entry No.........................

APPENDIX C

List of the foreign countries which have provided for inspection and certification in conformity with the requirements of the plant quarantine act of August 20, 1912.

- Australia.
- Barbados.
- Belgium.
- Bermuda.
- British Guiana.
- Canada.
- Cuba.
- Denmark.
- England.
- France.
- Germany.
- Guatemala.
- Holland.
- Hongkong.
- Ireland.
- Italy: Province of Padova (Padua) only.
- Jamaica.
- Japan.
- Leeward Islands:
  - Antigua.
  - St. Christopher-Nevis.
  - Dominica.
  - Montserrat.
  - Virgin Islands.
- Grand Duchy of Luxemburg.
- New Zealand.
- Philippine Islands.
- Scotland.
- Union of South Africa.
- Spain.
- Straits Settlements.
- Switzerland.
- Trinidad.
- Wales.
- Windward Islands:
  - Granada.
  - St. Lucia.
  - St. Vincent.

APPENDIX D.

STATE INSPECTION OFFICIALS

Alabama: State Horticulturist, Alabama State Board of Horticulture, Auburn, Ala.
Alaska: Agronomist in Charge, Alaska Agricultural Experiment Station, Sitka, Alaska.
Arizona: State Entomologist, Phoenix, Ariz.
Arkansas: State Ispector, Fayetteville, Ark.
California: Horticultural Quarantine Officer, room 11, Ferry Building, San Francisco, Cal.
Colorado: State Entomologist, Colorado Agricultural Experiment Station, Fort Collins, Colo.
Connecticut: State Entomologist, New Haven, Conn.
Delaware: Secretary, State Board of Agriculture, Dover, Del.
District of Columbia: United States Department of Agriculture, Federal Horticultural Board.
Florida: State Plant Board of Florida, Gainesville, Fla.
Georgia: State Entomologist, Atlanta, Ga.
Guam: Special Agent in Charge, Guam Agricultural Experiment Station, Island of Guam (via San Francisco).
Hawaii: Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.
Idaho: State Horticultural Inspector, Boise, Idaho.
Illinois: Chief Inspector, Office State Entomologist, Urbana, Ill.
Indiana: State Entomologist, Indianapolis, Ind.
Iowa: State Entomologist, Iowa State College, Ames, Iowa.
Kansas, North: State Entomologist, Kansas State Agricultural College, Manhattan, Kans.
Kansas, South: Entomologist, University of Kansas, Lawrence, Kans.
Kentucky: State Entomologist, Kentucky Agricultural Experiment Station, Lexington, Ky.
Louisiana: Entomologist, State Board of Agriculture and Immigration, Baton Rouge, La.
Maine: State Horticulturist, Augusta, Me.
Maryland: State Entomologist, College Park, Md.
Massachusetts: State Nursery Inspector, State House, Boston, Mass.
Michigan: State Inspector of Nurseries, East Lansing, Mich.
Minnesota: State Entomologist, St. Paul, Minn.
Mississippi: Entomologist, Agricultural College, Miss.
Missouri: Entomologist, University of Missouri, Columbia, Mo.
Montana: Montana State Board of Horticulture, Missoula, Mont.
Nebraska: State Entomologist, University of Nebraska, Lincoln Neb.
Nevada: Director, Nevada Agricultural Experiment Station, Reno, Nev.
New Hampshire: Deputy Commissioner of Agriculture, Durham, N. H.
New Jersey: State Entomologist, New Brunswick, N. J.
New Mexico: Horticulturist, New Mexico Agricultural Experiment Station, State College, N. M.
New York: Commissioner of Agriculture, Albany, N. Y.
North Carolina: State Entomologist, State Department of Agriculture, Raleigh, N. C.
North Dakota: Director, North Dakota Agricultural Experiment Station, Agricultural College, N. D.
Ohio: Chief Inspector, Ohio Department of Agriculture, Columbus, Ohio.
Oklahoma: Secretary, State Board of Agriculture, Oklahoma City, Okla.

Oregon: Secretary, State Board of Horticulture, Portland, Ore.
Pennsylvania: Chief Nursery Inspector, Harrisburg, Pa.
Porto Rico: Entomologist, Board of Commissioners of Agriculture, Rio Piedras, P. R.
Rhode Island: Entomologist, room 129, State House, Providence, R. I.
South Carolina: State Entomologist, Clemson College, S. C.
South Dakota: State Entomologist, South Dakota State College, Brookings, S. D.
Tennessee: State Entomologist, Knoxville, Tenn.
Texas: Chief Inspector of Nurseries, Houston, Tex.
Utah: State Crop Pest Inspector, Salt Lake City, Utah.
Vermont: State Nursery Inspector, Burlington, Vt.
Virginia: State Entomologist, Blacksburg, Va.
Washington: Commissioner of Agriculture, Olympia, Wash.
West Virginia: State Entomologist, Morgantown, W. Va.
Wisconsin: State Entomologist, State Capitol, Madison, Wis.
Wyoming: Secretary, State Board of Horticulture, Laramie, Wyo.

United States Department of Agriculture, Amendment No. 1 to Regulations Supplemental to Notice of Quarantine No. 37

Under authority conferred by the Plant Quarantine Act of August 20, 1912 (37 Stat., 315), it is ordered that Regulation 3 of the Rules and Regulations Supplemental to Notice of Quarantine No. 37 Governing the Importation of Nursery Stock and Other Plants and Seeds into the United States, effective June 1, 1919, be and the same is hereby amended to read as follows:

Regulation 3. Nursery stock and other plants and seeds for which permit is required.

The following nursery stock and other plants and seeds, not including, however, those named in Appendix A, which are governed by special quarantines and other restrictive orders now in force, nor such as may hereafter be made the subject of special quarantines, when free from sand, soil or earth, may be imported from countries which maintain inspection (see Appendix C), under permit upon compliance with these regulations, but, where a particular purpose is specified, for that purpose and no other:

(1) Lily bulbs, lily of the valley, narcissus, hyacinths, tulips and crocus.

(2) Stocks, cuttings, scions and buds, of fruits for propagation.

(3) Rose stocks for propagation, including Manetti, Multiflora, Brier Rose and Rosa Rugosa.

(4) Nuts, including palm seeds, for propagation.

(5) Seeds of fruit, forest, ornamental and shade trees, seeds of deciduous and evergreen ornamental shrubs and seeds of hardy perennial plants.

Provided, that the requirement as to freedom from sand, soil or earth shall not apply to sand, soil or earth used for packing the articles enumerated in item No. 1 of this regulation when such sand, soil or earth has been previously sterilized in accordance with methods prescribed by the Federal Horticultural Board under the supervision of a duly authorized inspector of the country of origin. Such sterilization shall be certified to by the duly authorized inspector of the country of origin.

Importations of nursery stock and other plants and seeds specified in this regulation, from countries not maintaining inspection, may be made under permit upon compliance with these regulations in limited quantities for experimental purposes only, but this limitation shall not apply to tree seeds.

Done in the District of Columbia this 12th day of February, 1919.

Witness my hand and the seal of the United States Department of Agriculture.

D. F. HOUSTON,
Secretary of Agriculture.

United States Department of Agriculture, Explanation of Provisions for Entry of Plant Novelties and Propagating Stock Under Quarantine No. 37.

Regulation 14 of the regulations relative to the importation of nursery stock and other plants and seeds has been revised and reissued. In its new form it is essentially an interpretation of the old regulation 14, rather than an enlargement of powers under the quarantine, inasmuch as the regulation, as worded in the quarantine as originally issued, was intended to cover exactly what is now more clearly stated in the new regulation. This regulation provides for the importation under a special permit from the Secretary of Agriculture, of limited quantities of otherwise prohibited stock for the purpose of keeping the country supplied with new varieties of plants and stock for propagation purposes not available in the United States. This amendment, however, does not apply to a few plants which have been specifically prohibited entry under other quarantines, as, for example, pines, Ribes and Grossularia from certain countries, and citrus, banana and bamboo stock.

The following explanations of regulation 14 are given to indicate the limitations under this regulation and the procedure to be followed in making importations of the two classes of plants specified, namely, new varieties and necessary propagating stock.

The expression "new varieties" is understood to mean plant novelties, that is, new horticultural or floricultural creations or new discoveries.

"Necessary propagating stock" is understood to mean stock of old or standard varieties imported for the multiplication of the plants in question as a nursery or florist enterprise as distinguished from importations for immediate or ultimate sale of the stocks actually imported, and such importations will be restricted to stocks which are not available in this country in adequate quantities.

The expression "limited quantities" used in regulation 14 is understood to mean with respect both to new varieties and to standard stocks, such quantities as will supply reasonable needs for the establishment of reproduction plants which may be thereafter independent of foreign supplies.

There is no limitation as to the number of permits for different plants or classes of plants under regulation 14, which an individual may request, but the applications will all be passed upon both as to necessity for the particular importation and as to the quantity adequate for the purpose intended, by experts of the department, for the information of the board prior to the issuance of the permits.

All importations under regulation 14 must be made under special permits through the office of Foreign Seed and Plant Introduction of the Department of Agriculture, but for the use of the individual importer. The importer will be required to meet all entry, transportation and freight handling charges. The department will make no charge for inspection and supervision. The necessary procedure for making such importations is as follows:

1. The Federal Horticultural Board will supply, on request, an application blank upon which request may be made for a special permit to import. This application embodies an agreement on the part of the importer that if the imported material is found on examination by an inspector of the Department of Agriculture to be so infested or infected with insects or disease that it can not be adequately safeguarded, it may be destroyed and such destruction will not be made the basis of a claim against the Department of Agriculture for damages. The application must be accompanied by a statement certifying that the plants to be imported are novelties or if standard varieties of foreign plants, that stocks in adequate quantities for their propagation are not available in this country, and that in either case they are to be imported for the establishment of reproduction plantings and not for immediate or ultimate sale of the stocks actually imported. In exceptional cases the importation of novelties may be made for personal use, but not for sale. The application must also give the name and address of the exporter, country and locality where the stock was grown, the name and address of the importer and the name and address of the nursery or other establishment in which the plants are to be reproduced on release.

2. If the permit is issued, the applicant will be furnished shipping instructions and shipping tags to be forwarded with his order to the exporter. The plants will, in consequence, be addressed in bond to the United States Department of Agriculture, Bureau of Plant Industry, Washington, D. C., United States of America, and indorsed, "Foreign Seed and Plant Introduction, for (insert name of importer)," and arrangements must be made with some responsible agency in Washington for the clearance of the plants when received through the Custom House at Georgetown, D. C., together with the payment of all charges involved.

3. Upon clearance through the Georgetown Custom House the material will be turned over to the office of Foreign Seed and Plant Introduction by the authorized agent of the importer, and in the specially equipped inspection houses and under expert care as to the welfare of the plants, be carefully examined by inspectors of the Federal Horticultural Board. If found free from dangerous insects or diseases, the shipment will be immediately and carefully repacked and forwarded by express, charges collect, to the importer.

4. Cleaning and disinfection will occur for slight infestation, but should the material be found to be so infected or infested with either disease or insects that it can not be so adequately safeguarded, it will either be destroyed, or, when possible and desirable, returned to the point or origin.

C. L. MARLATT,
Chairman of Board.

United States Department of Agriculture—Instructions for Sterilization of Sand, Soil or Earth Used for Packing Bulbs Imported Under Notice of Quarantine No. 37.

Amendment No. 1 to the regulations supplemental to Notice of Quarantine No. 37, provides that the requirement of regulation 3 as to freedom from sand, soil or earth of nursery stock and other plants and seeds permitted entry under that regulation, shall not apply to sand, soil or earth used for packing the articles enumerated in item No. 1, when such said, soil or earth has been previously sterilized in accordance with methods prescribed by the Federal Horticultural Board under the supervision of a duly authorized inspector of the country of origin.

The requirement as to sterilization may be met by heating the sand, soil or earth to a temperature of 100 degrees Centigrade (212 degrees Fahrenheit) and maintaining that temperature for a period of one hour. Such sterilization is accomplished at one of the field stations of this department by the use of a large iron receptacle holding about a cubic yard of soil. A fire is built under the receptacle and in a short period the contained earth is heated sufficiently to kill all larvae, nematodes, etc. It is necessary to keep the soil stirred while heating. Any device which will maintain the heat at the required temperature for one hour will be satisfactory to the board.

The invoice covering importations of bulbs packed in such sterilized sand, soil or earth must be accompanied by a certificate of a duly authorized inspector of the country of origin to the effect that the required sterilization has been accomplished under his direction. The certificate should indicate the marks and numbers on the cases and should contain such other information as may be necessary to identify the cases which it covers.

C. L. MARLATT,
Chairman of Board.

United States Department of Agriculture, Amendment No. 2 to Regulations Supplemental to Notice of Quarantine No. 37.

Under authority conferred by the Plant Quarantine Act of August 20, 1912 (37 Stat., 315), it is ordered that regulation 14 of the rules and regulations supplemental to notice of Quarantine No. 37, Governing the Importation of Nursery Stock and Other Plants and Seeds Into the United States, effective June 1, 1919 be, and the same is hereby, amended to read as follows:

Regulation 14. Special Permits for Importation in Limited Quantities of Prohibited Stock. Application may be made to the Secretary of Agriculture for special permits for the importation, in limited quantities and under safeguards to be prescribed in such permits, of nursery stock and other plants and seeds not covered by the preceding regulations for the purpose of keeping the country supplied with new varieties and necessary propagating stock; provided, that this shall not apply to nursery stock and other plants and seeds covered by special quarantines and other restrictive orders now in force, nor to such as may hereafter be made the subject of special quarantines. A list of nursery stock and other plants and seeds covered by special quarantines and other restrictive orders now in force is given in Appendix A of these regulations.

Done in the District of Columbia this 27th day of March, 1919.

Witness my hand and the seal of the United States Department of Agriculture.

D. F. HOUSTON,
Secretary of Agriculture.

United States Department of Agriculture, Quarantine on Account of Black Stem Rust, Notice of Quarantine No. 38.

The fact has been determined by the Secretary of Agriculture, and notice is hereby given, that the common barberry (Berberis vulgaris) and its horticultural varieties, as well as other species of Berberis and Mahonia, are capable of harboring the black stem rust of wheat, oats, barley, rye and many wild and cultivated grasses. Through the cooperation of the Department of Agriculture with State officials, local organizations and individuals, susceptible species of barberry and Mahonia have been very largely eradicated from the States of Nebraska, Iowa, Illinois, Indiana, Ohio, North Dakota, South Dakota, Minnesota, Montana, Wisconsin, Michigan, Wyoming and Colorado.

Now, therefore, I, David F. Houston, Secretary of Agriculture, under the authority conferred by Section 8 of the Plant Quarantine Act of August 20, 1912 (37 Stat., 315), as amended by the Act of Congress approved March 4, 1917 (39 Stat., 1134, 1165), do hereby quarantine, effective May 1, 1919, the States of Alabama, Arizona, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Idaho, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Mississippi, Missouri, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, and the District of Columbia, and by this Notice of Quarantine No. 38 do order that no plants of the following species, Berberis aethensis, B. altaica, B. amurensis, B. aristata, B. asiatica, B. atropurpurea, B. brachybotrys, B. brevipaniculata, B. buxifolia, B. canadensis, B. caroliniana (carolina), B. coriaria, B. cretica, B. declinatum, B. fendleri, B. fischeri, B. fremontii, B. Heteropoda, B. ilicifolia, B. integerrima, B. laciflora, B. lycium, B. macrophylla, B. neapalensis, B. neubertii, B. siberica, B. sieboldii, B. sinensis, B. trifoliolata, B. umbellata, B. vulgaris, including its subspecies and horticultural varieties, Mahonia aquifolium, M. diversifolia, M. glauca and M. repens, shall be moved or allowed to move interstate to points outside of the quarantined area.

This quarantine shall not apply to the movement by the United States Department of Agriculture of the products named for experimental or scientific purposes.

Done in the District of Columbia this 15th day of April, 1919.

Witness my hand and the seal of the United States Department of Agriculture.

D. F. HOUSTON,
Secretary of Agriculture.

APPENDIX

ORCHARD SPRAYING IN OREGON

(This article is taken wholly from College Bulletin No. 228, of the Oregon Agricultural College, prepared by Prof. H. P. Barss, Botanist and Plant Pathologist of the Oregon Experiment Station, and Prof. A. L. Lovett, Acting Entomologist of the Oregon Experiment Station.)

APPLES

The Young Orchard, if clean of disease and insects when planted, seldom requires any regular schedule of sprays. Thorough inspection should be made in the early spring, in the early summer, and in the fall, for possible troubles. Inspect the trees carefully for apple mildew, appletree anthracnose, San Jose and oyster-shell scale; examine for woolly aphis and borers, and look frequently during the growing season for bud weevils, aphis, tent caterpillars, etc. San Jose scale and woolly aphis particularly should not be neglected. When any of the troubles are present, follow out the spray schedule as outlined below to cover the particular case.

The Bearing Orchard. With few exceptions a regular spraying program should be adopted. The two worst fruit pests, apple scab and codling moth, are present in practically every well established orchard district in the State. Frequent inspection should be made for other insects and plant diseases, which if allowed to go unchecked, are liable to establish themselves and cause considerable loss in the orchard.

Winter Treatment. For powdery mildew, prune out as many of the mildewed twigs of the previous season as possible. For apple and pear scab, plow the fallen leaves under before the winter buds open, at any time consistent with soil conditions and the general orchard practice being followed.

For fire blight (see under "Pears") go over the orchard and remove and sterilize all holdover cankers. If holdover cankers are thoroughly eradicated from an orchard, the grower can hold the disease in check to an extent otherwise impossible. Look for collar and root rot due to blight and cut out and sterilize. If fire blight is present in the orchard, it is necessary to sterilize the pruning instruments used in the regular pruning, since wide dissemination of blight can take place in an orchard through failure to sterilize the pruning instruments after they have been used on infected fruit trees.

1. **Dormant Spray.** To be applied while the winter buds are swelling just before they open.

For scale insects and red spider mites.

Use lime-sulfur, 1 to 8 (1 gallon lime-sulfur to 8 gallons water) or miscible oil emulsion, 1 to 17.

Leaf Rollers. Where the leaf roller or green fruit worm is present it is advisable to use the miscible oil emulsion. Spray in the spring at the time indicated above. This oil spray will control scale, red spider and aphis.

2. **Delayed Dormant Spray.** To be applied a short time after the winter buds have burst. In the case of apples, when the leaves are about half an inch long.

For plant lice (aphides), red spider mite and bud moth.

Use lime-sulfur 1 to 18 or 20, plus nicotine sulphate 40%, 1 to 1200 (1 pint to 150 gallons) plus arsenate of lead 4 to 100 (4 lbs. to 100 gallons of dilute spray solution.)

The first spray for apple scab and often very important. Probably helpful in mildew control.

If plant lice and red spider are absent, omit the nicotine.

If bud moth is not serious, omit the arsenate of lead.

Injury. When used in the strength indicated, lime-sulfur is likely to burn the tips of the young leaves, etc., but experience has shown that this generally results in no particular harm. This application is usually very necessary.

3. **"Pink" Spray.** To be applied just before the petals open.

For scab, second spray; also for bud moth, leaf roller, leaf eating caterpillars.

Use lime-sulfur 1 to 25 or 30, plus arsenate of lead 4 to 100.

Where the insects mentioned above are not serious, omit the arsenate.

Cover all parts thoroughly, but aim not to drench.

4. **"Calyx" Spray.** To be applied just as the last petals are falling and before the calyx lobes close.

First codling moth and third scab spray.

Use lime-sulfur 1 to 35 or 40, plus arsenate of lead 4 to 100.

Where lime-sulfur injury is likely to occur in later sprays, add four pounds of atomic sulfur to each 100 gallons of lime-sulfur spray at this time to prepare the trees for the use of atomic sulfur alone later on.

5. **"Ten Day" Spray.** To be applied ten days or two weeks after the preceding.

For apple scab.

Use lime-sulfur 1 to 40 (or atomic sulfur 12 to 100).

It is not safe to omit this application, as new foliage and fruit surface is rapidly developing.

Injury. Under certain conditions lime-sulfur injury is likely to occur. If indications point to very warm weather atomic sulfur (12 pounds to 100 gallons) might be used as a substitute.

Use only a fine mist spray at this time and cover all surfaces evenly. Where leaf eating insects are present, add lead arsenate as above.

6. **The "4 to 5 Weeks" Spray.** To be applied 4 to 5 weeks after the calyx spray.

Use lime-sulfur 1 to 40, or Bordeaux 4-4-50, or atomic sulfur 12 to 100, plus arsenate of lead 4 to 100.

When moist weather occurs late in the spring this spray is required for the control of apple scab. Where lime-sulfur at this time is likely to cause injury, a substitute is desirable. Atomic sulfur may be used provided some of this material has been used on the trees earlier. Otherwise, it is likely to cause defoliation. If the down or fuzz has disappeared from the fruit, the Bordeaux at this time is not likely to injure.

The exact date for the application of this spray will vary with the season and with the locality. Approximate dates are the best we can submit. The date should correspond with the first deposition of eggs by the codling moth. Procure a standard thermometer, and take daily readings at 8 p. m. When the evening temperature registers 60 degrees or above it is time to apply this spray. As a general rule this date will follow the calyx spray by about 3½ to 4½ weeks in Eastern and Southern Oregon; 4 to 5 weeks in the Hood River Valley, and 5 to 6 weeks in the Willamette Valley. In the bearing orchard, it is never advisable to omit this application for the moth.

7. **The July Spray.** To be applied July 10 to 25.

For the second generation of the codling moth. It is this brood of worms which produces the costly "September sting."

Use lead arsenate 4 to 100.

In the summer codling moth applications, pay particular attention to the fruit. Use a fine misty spray and cover thoroughly the surface of every apple.

8. **The August Spray.** To be applied August 5 to 20.

For the second generation of the codling moth (also of some value for apple scab and apple tree anthracnose).

Use arsenate of lead 4 to 100 (plus Bordeaux mixture 4-4-50 if desired).

It is believed that if Bordeaux mixture is used at this time and the branches and fruit thoroughly coated, some protection will be afforded against the early fall infections of apple scab on the fruit and of apple tree anthracnose on both the fruit and branches. It would be preferable, however, to spray a few weeks later for these diseases.

9. **Early Fall Spray.** To be applied in early September, before the fall rains.

For apple tree anthracnose and apple scab.

Use Bordeaux mixture 4-4-50.

10. **Late Fall Spray.** To be applied soon after picking, late October or the first week in November.

For apple tree anthracnose (and scale, if lime-sulfur is used).

Use Bordeaux 4-4-50 or lime-sulfur 1 to 8.

The twigs, limbs and trunk should be given a complete and thorough coating.

The Woolly Apple Aphis is a serious orchard pest of both apple and pear. It attacks the tree both above and below ground and where once thoroughly established is a very difficult insect to eradicate. In blight infested districts it is undoubtedly an active agent in the dissemination of this disease, often carrying the infestation to the roots and crown of the tree. Every woolly aphis infested tree should be marked and given individual attention. Use kerosene emulsion 15 per cent solution (see directions further on), applying it freely to the infestation above the ground and to the trunk of the tree. Remove the soil exposing the surface rootlets and saturate with this solution, then recover.

Borers seldom attack thrifty, vigorous trees. Keep the trees in good condition by care and cultivation. Cut out borers where found and protect the wound with grafting wax or pruning compound. Use repellant wash No. 1 on young trees.

Powdery Mildew of the Apple. This disease is becoming quite serious in some sections of the State. Experiments for its control will be commenced in Oregon during the coming season. Definite recommendations can not be made at this time, but it is believed that the application of lime-sulfur through the spring or of lime-sulfur first and atomic sulfur later, as suggested above for scab control, will result in material decrease if not complete control of the disease. In California "iron sulfide mixture" is used in the control of mildew alone, with apparently good results.

Fire Blight. This is Oregon's most serious orchard disease. It should be watched for constantly and upon being discovered steps should at once be taken to eradicate it from the neighborhood as well as from the orchard where found. Notify the fruit inspector and get his assistance. For a discussion of the disease see under "Pears."

PEARS

In general, the same recommendations for the application of sprays as given for the apple will apply for the pear.

Blister Mite. On pear varieties which permit the practice, use lime-sulfur 1 to 12 as the tips of the leaves are emerging. For varieties where the fruit buds open with or before the leaf buds, apply the solution shortly before the blossoms open, and dilute the lime-sulfur 1 to 15.

Codling Moth. The calyx application of arsenate of lead is not necessary for the codling moth.

Pear Slug. In the "10-day" spray (No. 5 under "Apples") add lead arsenate 4 to 100 for the first brood. The regular summer application (late July or early August) for the control of codling moth will usually control the second brood of slug.

Pear Scab. Control as for apple scab. Give the first application in the "delayed-dormant" condition before the cluster of blossom buds has pushed out to any considerable extent. In this application use lime-sulfur 1 to 15, where blister mite is present. In later applications use a little weaker solution than recommended for apples.

Fire Blight (Pear Blight). Watch for fire blight. There are few parts of Oregon that have not been invaded by this disease. If not detected in its first attacks in an orchard and promptly eradicated, the disease increases rapidly and it becomes a matter of great expense and difficulty to overcome it. Wherever it is discovered, the fight against it should become a community matter, since its presence in one orchard is a menace to all the orchards of the community. In those sections of Oregon where the disease is being successfully held in check, the fight has been made a distinctly community fight and funds have been provided for the careful and thorough inspection of the orchards throughout the district and for the enforcement of the eradication measures necessary for the control of the disease. Where this has not been done, the disease has swept in, resulting in tremendous damage to both pear and apple orchards.

If any grower discovers a diseased condition that he suspects may be fire blight, he should send a fresh specimen at once to the Agricultural College or to his local fruit inspector for identification. In this way steps may at once be taken, if it prove to be fire blight, to locate the source from which it entered the orchard, and by the adoption of proper methods, to eradicate the disease from the grower's own place and from the entire neighborhood. No one should try to eradicate the disease himself until he finds out from a reliable source just how to do it. Because of the extremely contagious nature of the disease, ignorant efforts can easily result in spreading it instead of checking it.

Fire blight is caused by bacteria of a particular kind. It may be recognized in general by the wilting and dying of blossoms, spurs, twigs and branches. The dead foliage clings to the twigs, turning black in the case of the pear, brownish in the apple. The bark invaded by the bacteria also turns dark colored. When the disease is very active, bacteria ooze out of the affected parts in pearly drops that contain millions of individuals. This ooze is attractive to insects, which become contaminated with the germs and easily spread disease. The exudition also may be washed by rains or spattered on foliage and green shoots and start new infections in this way.

The disease is carried over the winter in the margins of dead areas known as holdover cankers. In the early spring the bacteria become active in these cankers. From these sources fire blight is carried by insects, birds, etc., to the blossoms or other healthy parts, thus producing new infections that develop rapidly. The disease is often spread by unsterilized pruning tools. Any part of the tree may be attacked. It usually begins in the spring as a blossom blight. Later twig blight and blight cankers make their appearance. Water sprouts are very susceptible and the blight makes its way rapidly down such shoots to the trunk or roots where body blight, collar rot, and root blight may develop with the most serious consequences.

The season of the most rapid development of fire blight corresponds with the season of most active growth of the tree, and warm, moist conditions which accelerate tree growth also favor the increase of the disease. In general, the healthiest and most vigorous trees suffer the most severe effects. In addition to the apple and pear, quinces are very susceptible. Native pomaceous trees such as wild crab, hawthorne and service berry are also attacked.

Control. The only successful method of fighting fire blight, whether in a single orchard or in an entire community, is by removing the diseased parts or tissues from affected trees as rapidly as infections are discovered, and by cutting out all holdover cankers. In the fall and winter the trees should be gone over and inspected, branch by branch and limb by limb and all dead parts cut out and the wounds sterilized. The eradication of holdovers is of tremendous importance and where thoroughly done is of immense benefit. Later, as the disease makes its appearance during the growing season, active efforts should be taken to detect and eradicate every new case. In cutting during the most active period, the bark should be removed or the branch cut back from one to two feet below the point of lowest evident discoloration. If the outbreak is serious, such methods should be adopted in the orchard as will check the growth of the trees and thus tend to check the rapidity of the advance of the disease.

All wounds should be sterilized with a 1 to 1000 solution of corrosive sublimate (bichloride of mercury). This material can be secured at any drug store with directions for preparing the proper strength. It will attack metals and therefore should be kept in clean wooden or glass containers only. The material is deadly poison and should be so labeled. Keep a sponge or cloth soaked in the solution and wash the surface of every wound. The cutting and pruning instruments ought to be disinfected after each cut. Do not use the solution after it has become dirty, and keep the sponge freshly wet while it is being used. Brush and bark removed from trees should be burned at once and not left on the ground to attract insects.

Growers who are expecting to plant pears in the future will do well to secure information in regard to the fire blight resistant pear stocks which have been under investigation by Prof. F. C. Reimer of the Southern Oregon Experiment Station, at Talent, Oregon. Professor Reimer has made some very important and very encouraging discoveries in this connection which will be of immense value to the future pear industry. Inquiries may be addressed to Professor Reimer himself or to the Oregon Agricultural College at Corvallis.

PEACHES

1. **The Dormant Spray.** To be applied at least one or two weeks before the buds begin to open. (February for most parts of Oregon.)

For peach leaf curl and San Jose scale.

Use lime-sulfur 1 to 8. If no scale is present Bordeaux 6-6-50 will be effective.

Infections of peach leaf curl take place just as the leaves are emerging. A single spray will control the disease if applied before the buds begin to come out. To be effective the fungicide must cover every bud.

2. **Late Dormant Spray.** To be applied just as the first buds begin to open in the spring.

For peach twig miner, aphis, red spider mite.

Use lime-sulfur 1 to 12, plus nicotine sulfate (40%) 1 to 1200, (one pint to 150 gallons). Add arsenate of lead 3 to 100 (3 pounds paste to 100 gallons of dilute solution), if the bud moth is present.

If aphis and red spider are not present omit the nicotine sulfate. This spray will probably be of some value for the control of powdery mildew and to some extent possibly for brown rot, but will usually be too late for peach leaf curl.

3. **To Be Applied When the "Shucks" or Flower Parts Fall Off.** For peach blight, fruit spot and shot hole, for powdery mildew and brown rot.

Use self boiled lime-sulfur 8-8-50.

Failure to control spring infections of peach blight is due largely to beginning too late. This is a very important application.

4. To Be Applied Two Weeks Later.

For peach blight, fruit spot and shot hole, brown rot and mildew.

Use self boiled lime-sulfur 8-8-50.

To protect the newly developing surfaces of the fruits, foliage and shoots against infection. Spray thoroughly. If season is rainy another application two or three weeks later would be beneficial.

5. To Be Applied One Month Before Picking Fruit.

For peach brown rot, mildew, bud moth and peach twig miner.

Use self boiled lime-sulfur 8-8-50, plus lead arsenate 3 to 100.

As the fruit matures the danger of brown rot increases. This application is aimed to cover, thoroughly, all parts of the fruit for the last time before picking. This will also help to control peach blight in late varieties.

In Eastern Oregon the peach twig miner frequently attacks the nearly mature fruit causing it to bleed or gum profusely. This summer fruit injury appears to be confined to the eastern section of the State. The arsenate may therefore be omitted in Western Oregon unless the bud moth is serious.

6. To Be Applied as Soon as the Fruit Is Picked.

For peach blight.

Use Bordeaux mixture 4-4-50.

This spray is designed to protect the branches and buds from the first infections of the peach blight that occur as soon as the fall rains start. Cover all branches and buds thoroughly.

7. To Be Applied About November First.

For peach blight.

Use Bordeaux mixture 6-6-50.

This spray is given to insure adequate protection against the blight fungus through the late fall and early winter rains. It is the opinion of the plant pathologist that if the two fall sprayings were thoroughly applied in the manner recommended above, there would be little need of spring spraying for fruit spot and shot hole.

Peach Root Borers. On young trees use repellant wash No. 1. For older trees cut out borers and use paving asphaltum, grade "C" or "D." Write to Experiment Station, Corvallis, Oregon, for directions.

PRUNES AND PLUMS

1. **Winter Treatment.** To be applied just as the winter buds are opening.

For San Jose scale, red spider mite, twig miner and aphis (for brown rot see below).

Use lime-sulfur 1 to 8, plus nicotine sulfate (40%) 1 to 1200 (one pint to 150 gallons).

If aphis and red spider are not present, omit nicotine.

This application will not be effective for the control of brown rot. During the later winter, however, all dead twigs and branches and all mummied fruits should be removed from the trees and burned to prevent infection from these sources when the buds come out. In the regular pruning work aim to let in plenty of light and air to the interior of the trees.

2. To Be Applied Just Before the Blossoms Open.

For brown rot, blossom and twig blight and bud moth.

Use Bordeaux mixture 4-4-50 or lime-sulfur 1 to 30, plus arsenate of lead 3 to 100.

3. To Be Applied Ten Days or Two Weeks After the Petals Fall.

For brown rot and Coccomyces (Cylindrosporium) leaf spot or shot hole.

Use Bordeaux 4-4-50 or lime-sulfur 1 to 50.

A previous application for brown rot just after the petals drop would be of benefit, but for the sake of economy is not insisted upon. The use of a sticker with the Bordeaux would be desirable.

4. To Be Applied Two or Three Weeks After the Preceding.

For leaf spot and brown rot.

Use Bordeaux 4-4-50, or lime-sulfur 1 to 50 or self boiled lime-sulfur 8-8-50.

Drenching should be avoided but all parts, upper and lower, of foliage and fruit should be covered with a fine mist. Use a sticker with Bordeaux.

5. To Be Applied One Month Before Picking.

For brown rot (bud moth).

Use Bordeaux 4-4-50 with sticker.

(Omit sticker and add arsenate of lead 3 to 100 if bud moth is serious.)

This is the most important application of all for the control of the brown rot as it is designed to protect the fruit against the infections that usually occur in their most serious abundance as the fall rains come on and the fruit ripens. If any sprays have to be omitted do not omit this one. Use a fine mist with high pressure, and get a coating on all sides of the fruit. (To secure thorough protection against brown rot the trees ought to be sprayed about once a month through the summer, but it is not believed that the value of these extra summer applications has been sufficiently demonstrated under average Oregon conditions to warrant their general adoption at this time).

Brown Rot. Since the rotted prunes are a source of infection, some means for destroying them as rapidly as they fall should be employed. Not only do the infected prunes immediately produce a crop of spores able to infect still healthy fruit, but if not destroyed they will be able to discharge a new crop of spores from the buried or half buried mummies the second spring following. To allow them to stay on the ground is to make satisfactory arrangements for a future abundant infection. The only practical method that has been adopted in Oregon is that of allowing the hogs to run in the orchard and clean up the rotting fruit. A half dozen animals in a large orchard, however, will soon become glutted with the fruits and will not devour the flesh, which is the part that carries the fungus. Enough hogs must be provided to clean up flesh and all.

Bud Weevil. Often attack young trees, particularly when near uncleared areas. They sometimes do serious injury to grafts that are just starting well. Jar insects from tree and apply belt of tanglefoot around trunk about 15 inches above surface of soil.

Root Borer. See under "Peach."

Internal Browning. In many prune-growing sections of Oregon in certain seasons there occurs a great deal of injury to the fruit from the softening and browning of the flesh commencing around the pit and often accompanied by more or less shrinking of the prune. This condition is not caused by the presence of any parasite, is not infectious, and can not be prevented or controlled by spraying. It is an effect due probably to unfavorable climatic and soil relations as well as to the condition of the trees during the ripening period. No satisfactory control method has been worked out. During the season of 1915 this trouble was exceedingly common and serious and was wrongly called "brown rot" by many growers and shippers, a fact which resulted in confusing this with the fungous disease correctly known as brown rot.

CHERRIES

1. **The Dormant Spray.** To be applied just as the winter buds are opening.

For San Jose scale, aphis and red spider.

Use lime-sulfur, 1 to 8, plus nicotine sulfate (40%) 1 to 1200 (1 pint to 150 gallons), plus lead arsenate 3 to 100 (3 pounds of paste to 100 gallons of dilute spray solution).

Apply tanglefoot in a band around the trunk to prevent ants from carrying the aphis up the tree.

2. **To Be Applied Just Before the Blossoms Open.**

For brown rot, bud moth and fruit tree leaf syneta.

Use Bordeaux 4-4-50 or lime-sulfur 1 to 30 plus arsenate of lead 3 to 100. Nicotine sulfate (40%) should be added if aphides are bad.

3. **To Be Applied About Ten Days or Two Weeks After the Petals Fall.**

For brown rot, Coccomyces (Cylindrosporium) leaf spot and cherry slug.

Use Bordeaux 4-4-50 or lime-sulfur 1 to 50, plus lead arsenate 3 to 100.

Where brown rot is bad an additional previous spraying just after the petals fall would doubtless be beneficial.

4. **To Be Applied About Two or Three Weeks After the Preceding.**

For brown rot and leaf spot.

Use Bordeaux 4-4-50 or lime-sulfur 1 to 50.

5. **August Spray.** To be applied about August 1 to 10.

For bud moth and slug where these pests are serious.

Use lead arsenate 3 to 100.

Bacterial Gummosis of Cherry. This disease is common in the Western Oregon cherry growing sections and seriously affects young plantings particularly from their third to sixth or seventh years, but does not often produce serious results on older trees. All common commercial varieties of sweet cherries are affected to a greater or less extent. The sour cherries and the Duke cherries, however, are affected very little or not at all.

20-ACRE CHERRY ORCHARD OF EX-COMMISSIONER L. T. REYNOLDS, SALEM

Control. After an orchard is already set out there is nothing that can be done to check the disease except the careful and complete removal of the diseased bark as soon as cankers are discovered. The same methods should be adopted as recommended for fire blight control. The holdover cankers, however, should all be removed before autumn, if possible in the spring, as there is then a greater chance of rapid healing. The wounds after sterilization should be coated with a good paint to prevent heart rot, and these areas should be repainted as often as necessary to keep a complete protection over the wood.

Prevention. It has been found that practically all socalled Mazzard seedlings are resistant to this disease and it has been proved that to set out Mazzard seedlings, or similar, vigorous, resistant, sweet cherry seedlings, and after two or more years to graft or bud the desired commercial variety onto the limbs is a successful method of avoiding serious consequences from the disease. The danger of girding trunks and limbs is eliminated and the amount of bacterial gummosis appearing in the tops is much reduced. Among the commercial varieties commonly grown in Oregon, the Lambert is more resistant than the Royal Ann or Bing but it is by no means free from the disease.

Shot Hole Borer. This small borer attacks practically all of our fruit trees. It is particularly serious on the cherry, prune and peach. The pest never attacks healthy, vigorous trees. Keep trees in vigorous growing condition by proper cultivation and draniage. Where the pest occurs, cut out seriously affected limbs or trees and burn. Paint slightly infested portions with deterrent wash No. 2. Apply in late March and repeat at three week intervals until the pest is checked.

INSECTICIDES

Materials which kill insects or which deter the insect from attacking plants are termed insecticides. There are two general types of insecticides:

1. **Arsenical poisons,** to be applied to the foliage and fruit. Poisons are for insects which devour foliage or chew their food. Example—caterpillars.

2. **Contact Insecticides** for soft-bodied insects which suck their food through a beak. Insects of this type generally insert the beak inside the tissue of the plant and suck out the juice from within. No poison applied to the exterior of the plant would materially affect them. Contact insecticides, to be effective, must actually wet the insect. Example—plant lice.

ARSENICAL POISONS

Arsenate of lead is the standard arsenical poison spray for the control of insect pests. The majority of the commercial arsenates of lead are good; they conform to the standard as required by law; have a low percentage of water soluble arsenic; and are very satisfactory for all general spray work.

Arsenate of lead is prepared in both the paste form and as a powder. Both are equally effective in the control of insect pests. The proportions recommended in this bulletin are figured on the basis of the paste form. In case the powdered arsenate of lead is employed use only one-half as much as recommended.

Use. Arsenate of lead may be used alone for the control of leaf eating insects, codling moth, etc. It may be combined with the following materials and used with reasonable safety on apple foliage; lime-sulfur, Bordeaux or iron sulfide, where it is desirable to combat both a fungous trouble and insects. It may be combined with nicotine sulfate solutions or with kerosene emulsion when it is desired to treat both sucking insects and chewing insects. Combinations of lead arsenate, lime-sulfur or Bordeaux and a nicotine sulfate solution, may be used where desirable.

The combination of lead arsenate and soap; lead arsenate, Bordeaux, and resin sticker; lead arsenate, soap and lime-sulfur; or lead arsenate, kerosene emulsion and lime-sulfur, are not advisable on apple foliage, owing to the likelihood of severe foliage injury.

In preparing the arsenate of lead either powder or paste for the spray tank, first make up as a thin paste and add to partly filled tank or place in bowl of strainer and wash into tank with hose, having agitator in motion. The arsenate should never be placed in the spray tank first nor added in the undiluted bulk form.

CONTACT INSECTICIDES

Lime-sulfur is the standard spray for the control of San Jose and oyster shell scale. It also has insecticidal properties when used against the peach twig miner, and the red spider, or spider mites, and probably to a lesser extent against other scale insects and hatching plant lice.

Commercial Nicotine Sulfate sprays have the advantage of being easily prepared and do not burn foliage. They generally run about 40% nicotine, a concentration which permits of high dilutions. They are very effective against plant lice, etc., at dilutions ranging from 1 to 1000 and 1 to 2000. They may be used with fish oil soap or whale oil soap and water or with dilute spray solutions of lime-sulfur or Bordeaux. For use with lead arsenate see above.

Miscible Oil Emulsions are commercial preparations in which the emulsifier is incorporated in the oil during the manufacture. They represent our highest type of oil emulsion spray. They have a remarkable power of penetration, tend to spread out evenly over a sprayed surface, and give effective control where an oil spray is desired.

Kerosene Emulsion is usually prepared as a stock solution and then diluted, as used, to the desired strength for spraying.

Whale oil soap	½ pound
Water	1 gallon
Kerosene	2 gallons

Dissolve the soap in the boiling water. Remove from the fire and add the kerosene, stirring vigorously. The solution must now be agitated until it assumes a thick, creamy, consistency that does not separate on cooling. This condition is most readily brought about by the use of a small bucket pump, forcing the solution through the hose and back into the container.

About a seven per cent solution will serve for most ordinary soft bodied insects. In some cases a heavier dosage is necessary and in a few cases a weaker dilution is advisable. The following dilutions will probably serve all ordinary purposes. The figures are given on the basis of one gallon of the stock solution.

To obtain four per cent solution, add fifteen and two-thirds gallons of water.

To obtain seven per cent solution, add eight and one-half gallons of water.

To obtain twelve per cent solution, add four and one-half gallons of water.

To obtain fifteen per cent solution, add three and one-half gallons of water.

Kerosene emulsion is particularly effective against the aerial form of the woolly aphis and when properly prepared is a very effective contact insecticide.

Summer applications of oil sprays are best applied on bright sunny days when there is a slight breeze blowing.

For combinations see under "Lead Arsenate" above.

Deterrent Washes:

No. 1. For borers:

Soft soda soap	10 gallons
Crude carbolic acid	1 pint

The soft soap is thinned to the consistency of thick paint by the addition of a strong solution of washing soda. This combination constitutes the soft soda soap used with the crude carbolic acid.

No. 2. For shothole borer:

Water	3 gallons
Soft soap	1 gallon
Crude carbolic acid	½ pint

Mix and paint over infested portions of the tree with a brush.

FUNGICIDES

Fungicides are in reality preventives. They can not cure an injury that is already produced, nor stop the progress on an infection after the fungus has entered the tissues of the plant. Fungicides must be so applied that the tree and its foliage and fruit are protected at the time when infections would naturally take place, and every bit of exposed surface must be covered if perfect protection is to be secured.

BORDEAUX MIXTURE

This fungicide has been for a long time the most widely used material for controlling fungous diseases of plants. It is now being supplanted to a considerable extent by lime-sulfur and other materials, although for certain diseases Bordeaux is still the most efficient and safest preventive known.

Bordeaux mixture is a combination of copper sulfate (bluestone) and lime. For winter use it is generally made up in what is known as the

6-6-50 Formula

6 lbs. bluestone (copper sulfate)
6 lbs. stone lime (best grade)
50 gallons water

For trees in leaf it is often made up in the

4-4-50 Formula

4 lbs. bluestone (copper sulfate)
4 lbs. stone lime (best grade)
50 gallons water

Other proportions are also frequently used.

Manufacture. It is of great importance that Bordeaux mixture be properly prepared. It must be made fresh each time it is to be used. Stock solutions of bluestone alone or of lime alone may be kept almost indefinitely, but the mixed lime and bluestone solutions rapidly deteriorate on standing. The barrels or tanks in which Bordeaux mixture is made up and the container for the stock solution of copper sulfate should always be of wood since the copper will attack and destroy iron. On this account it is well to have wooden hoops on the barrels. The stone lime used should be of the best quality.

Stock Solutions. If large quantities are used, it is best to prepare stock solutions which contain one or two pounds of the bluestone or lime, respectively, for each gallon of water. For example, take a fifty-gallon barrel of water and suspend near the top a coarse sack containing fifty pounds of bluestone. After a few hours it will have dissolved. Take also fifty pounds of quicklime and slake carefully with constant stirring and the addition of water as needed to prevent it from becoming dry and "burning." When thoroughly slaked, add water to make up to fifty gallons. These stock solutions then contain each one pound of the original material to one gallon of water. If kept for a long time the stock solutions may lose volume by evaporation. This should be made up with water before using.

Methods. The Bordeaux mixture may be made in a satisfactory manner by several different methods, but the two concentrated solutions should never on any account be mixed together without dilution. The following method will be found to give good results, using the "one-pound-to-the-gallon" stock solutions mentioned above. The quantities given here will make fifty gallons of the common 4-4-50 formula. If a stronger or weaker solution is desired, the quantities of the stock solutions should be increased or decreased to correspond. Larger or smaller amounts may be made up, of course, using the same proportions:

1. Take four gallons of the stock copper sulfate solution and add 21 gallons of water.

2. Stir up the stock solution of milk of lime thoroughly, take four gallons of this and add 21 gallons of water.

3. Pour the two together slowly through strainer into tank or barrel, stirring thoroughly, or pour one into the other, stirring thoroughly.

It is often convenient to prepare the two solutions on an elevated platform and run them simultaneously from the dilution tanks directly into the spray tank.

Cautions. The spray tank or barrel should be rinsed free from all dirt and foreign particles before putting in the spray material; and the spray mixture before going into the spray tank must be strained through a strainer of copper wire, twenty meshes to the inch. This is very important. Always use brass or bronze spray rods or connections, since Bordeaux will attack iron. Always rinse out spray tank, hose, and rod with clean water after using. Before using, test the Bordeaux with red litmus paper secured from the druggist. If the solution is correct, it will have an excess of lime and the litmus paper will turn blue. If it does not turn blue, add more milk of lime to the solution till it gives the right color. The formula given in this bulletin call for an excess of lime so that there is little danger of excess of copper unless the lime is of very poor quality. Where the lime is insufficient, the uncombined bluestone is injurious to fruit and leaves.

Bordeaux Injury. This material often causes severe russetting of apple fruit, if applied while the fruit is young, particularly when the application is followed by rainy spells. When the fruit and foliage are more mature, it can be safely used in late sprayings. In the early part of the season, however, lime-sulfur will control fungi with much less danger of injury. Bordeaux is generally considered throughout the country to be very dangerous for stone fruit foliage. Oregon growers, however, have sometimes used it on peach and prune foliage with no apparent ill effect.

Combination. Bordeaux may be combined without detriment with arsenate of lead and with nicotine sulfate preparations. The spreading and adhesive qualities of the fungicide may be increased by adding some form of soap "sticker," but no soap of any sort can safely be added to a solution containing arsenate of lead.

Resin Fish Oil Sticker. In spraying fruits and foliage with a very smooth or waxy skin, it is often of great advantage to add some material which will increase the spreading and adhesive qualities of the spray. The following formula will give good results:

Resin	5 pounds
Potash lye	1 pound
Fish oil	1 pint
Water	5 gallons

Place the oil and resin in a large iron kettle and heat until the resin is dissolved. Remove from fire and cool somewhat to prevent sputtering and boiling over when the lye is added. The lye should be dissolved in a little water and the solution added slowly with stirring to the resin oil mixture. Place again over the fire, add the required amount of water and boil for an hour or more until the sticker will mix perfectly with cold water, forming an amber colored solution.

Use two pounds with fifty gallons of dilute spray. This sticker can not be used with ordinary lime-sulfur because of the chemical reaction which takes place. It is used with excellent effect with Bordeaux mixture and would probably be of value when added to self boiled lime-sulfur or atomic sulfur.

LIME-SULFUR

This mixture has in recent years come to take the place of Bordeaux mixture and other fungicides for the control of many plant diseases. Its effectiveness as an insecticide against San Jose scale gives it an added advantage. It is a combination of lime and sulfur, manufactured in concentrated form, and diluted with water to various strengths for various purposes. Like Bordeaux, this material under certain conditions, has drawbacks which must be taken into consideration.

Commercial Concentrated Lime-Sulfur. This material is now made and sold in large quantities by many reliable firms in this State and elsewhere. The commercial solutions are usually fully equal, if not superior to, the average home made lime-sulfur.

Unless a grower has a large acreage or unless several growers can combine and make lime-sulfur for all at one plant, it is usually more economical to purchase the commercial article. Taking into consideration the cost of materials, equipment, time and labor, it may be said that the cost of making lime-sulfur in small quantities on the farm will generally be considerably greater than the cost of the commercial article at prevailing prices.

How to Make Lime-Sulfur. Lime-sulfur may be prepared by boiling the materials over an open fire, but this method is less satisfactory and uniform in its results than that in which live steam under pressure is used in the boiling process.

Chemist H. V. Tartar, of the Orégon Agricultural Experiment Station, after testing various ways of making this material, recommends the following method as one which if carefully followed will give a practically uniform product of high quality, testing just about 30 degrees Baume. "Take 110 pounds of good quality stone lime and slake it. Then take 220 pounds of finely ground sulfur, sifted to remove lumps, and mix carefully with a little water until a rather thick, but smooth, paste is secured. Add the sulfur paste to the slaked lime in the vat or cooker. Then add water to make the volume of the mixture 108 gallons. Turn in the steam. Sufficient steam pressure should be provided to bring the material to a boil in about twenty mintes. If much longer is required the condensing steam will dilute the solution too much. To insure complete combination of the sulfur and lime the material should be thoroughly agitated through the whole of the cooking. After it has reached an active boil, allow the mixture to continue boiling vigorously for thirty or thirty-five minutes. Never boil more than thirty-five or forty minutes, as changes begin to occur that will reduce the test of the solution. The solution should be allowed to cool as rapidly as possible. After the sediment is allowed to settle, the supernatant liquid is drawn off. This should give about eighty-five gallons of concentrated lime-sulfur solution testing about 30 degree Baume. The cooking vat should never be filled more than two-thirds full, since the mixture will seethe up a great deal while the chemical action is going on. In making up lime-sulfur in larger or smaller quantities, the same proportions of lime and sulfur and water should, of course, be used."

Where the cooking is done in a fifty gallon barrel or kettle the formula given below gives about the quantities desirable:

30 pounds good quality stone lime
60 pounds finely ground sulfur
Water sufficient to make 30 gallons

If prepared in kettle with fire beneath, the volume should be increased to about thirty-five gallons at the start to allow for evaporation.

Dilution. The grower who makes his own lime-sulfur should always secure from the druggist a Baume acid scale hydrometer to test his stock solutions. Otherwise he will have no idea as to the correct amount of water to use in diluting for use in spraying. The commercial solutions have the strength marked on the barrel. The following table shows the number of gallons of water to use for the usual winter or dormant strength and for the average summer or foliage strength with each gallon of concentrated lime-sulfur ranging in test from 25 to 35 degrees Baume. Peaches should not be sprayed with lime-sulfur of any strength when leaves are out.

Lime-Sulfur Dilution Table

Hydrometer test of concentrated solution	Number of gallons of water to one gallon of concentrated solution	
	Winter strength	Summer strength
35	9	45
34	8¾	43
33	8¼	41
32	8	40
31	7½	38
30	7¼	36
29	7	35
28	6½	33
27	6¼	32
26	6	30
25	5½	29

The different proportions of lime-sulfur recommended in this bulletin for the various spray dilutions are based on the use of a concentrated solution testing approximately 32 degrees Baume. If the stock solution tests weaker or stronger than this, the amount of water used to dilute should vary accordingly.

Injury. Lime-sulfur, even in very dilute form, is liable to injure peach foliage severely. Under certain conditions prune fruit and foliage have also been injured by it. Even apple fruit and foliage often suffer, particularly in the late spring when very hot weather occurs. The reasons for the injury are not clear, but the use of lime-sulfur should, if possible, be avoided for the late apple scab sprays, especially in sections where spells of extremely hot weather are likely to occur. If the fruit is sufficiently developed, Bordeaux may be substituted and such materials as atomic sulfur may prove to be satisfactory if certain precautions are observed. Self boiled lime-sulfur also ought to be harmless and of some value as a substitute.

Combinations. Lime-sulfur may be combined without detriment with nicotine sulfate preparations to control plant lice and with arsenate of lead for codling moth and foliage eating insects, or with both nicotine and arsenate together. It can not be used safely with a soap or resin sticker.

Self Boiled Lime-Sulfur

This material was devised as a substitute for the ordinary fungicides, which, if used on peaches and other stone fruits in foliage, are likely to cause serious injury. It has been used successfully for the control of brown rot and other diseases of stone fruits without injury. It is a mixture of sulfur and lime with but very little chemical action occurring during its preparation. The formula most commonly recommended is the

8-8-50 Formula

8 pounds stone lime (best quality)
8 pounds sulfur (finely ground)
50 gallons water

Manufacture. It is most satisfactory to make up three or four times the formula at one time. Actively slaking quick lime should be used if possible.

1. Place the lime in a barrel and add enough water to start active slaking.
2. As soon as this begins, add the required amount of sulfur, after sifting it to break up lumps, or make a smooth paste of the sulfur and add to the lime.
3. Stir the mixture constantly and add water from time to time to prevent burning and to bring to the consistency of a thin paste. The slaking of the lime should boil the mixture actively for several minutes. As soon as the slaking is completed, which should not occupy more than 15 minutes, fill the barrel with cold water to prevent further boiling.
4. Strain through a sieve (twenty meshes to the inch) into the spray tank, adding whatever water is necessary to bring up to the required volume. An efficient agitator must be used while spraying, because of the heavy sediment.

Combinations. Self boiled lime-sulfur may be combined with arsenate of lead and nicotine sulfate preparations.

Atomic Sulfur

This is a commercial preparation consisting of very finely divided sulfur mixed with organic materials and put on the market in the form of a paste. It is diluted before using. This material has not been fully tested under Oregon conditions, but experiments indicate that during the early part of the spring, when cool, cloudy weather is likely to prevail, it is not so effective as later on during warmer weather. It is intended to be used as a convenient substitute for self boiled lime-sulfur or sulfur dust in controlling such diseases as brown rot and mildew on peaches and other stone fruits and mildew and scab on apples when the ordinary lime-sulfur is likely to cause injury.

Injury. Atomic sulfur seems generally to cause very little spray burn. It has been found, however, to bring about serious dropping of foliage at times when applied late in the spring on apple trees that had not received any application of this material previously. The late spring application, however, caused no defoliation on trees sprayed earlier in the season with this material. It must be stated that the use of atomic sulfur in Oregon is still in the experimental stage.

Combinations. Safe with arsenate of lead and nicotine sulfate.

Iron Sulfide Mixture

"Iron sulfide mixture" made according to Ballard's formula (U. S. Department of Agriculture, Bulletin No. 120) has been found very successful for the control of mildew alone on apples in California. A simplification of this method is suggested for Oregon growers who may wish to experiment with this material:

4 pounds iron sulfate (copperas)
1 gallon lime-sulfur (33 degrees Baume)
200 gallons water

Dissolve the iron sulfate in a few gallons of water. Fill the spray tank with water, add the lime-sulfur and start the agitator. Add slowly the dissolved iron sulfate. A black precipitate will be formed. Enough lime-sulfur should be used to combine with all the iron sulfate.

Dust Spraying

This method of controlling orchard diseases has not been tested out in Oregon up to the season of 1916. While there appear to be some possible advantages in this method, yet there are certain possible drawbacks to be reckoned with. Since this method of dealing with orchard pests has not been given sufficient practical demonstration in the United States, growers are urged to be cautious about substituting the dust method for the tested and tried methods of spraying until the fungicidal efficiency of the new method shall have been demonstrated beyond question by thorough tests under Oregon conditions, which, by the way, are distinctly unlike the conditions in any of the eastern states.

COMBINED BORDEAUX OIL EMULSION SPRAY

By Dr. C. A. Macrum

This emulsion spray was evolved by Dr. C. A. Macrum, commissioner for the Fourth District, State Board of Horticulture.

If applied as the buds are opening, before the blossoms appear, will control scab, San Jose scale, aphis, leaf roller, red spider, curl leaf of the peach and the copper will be present to prevent the ravage of the anthracnose spore when the rains come in the fall of the year, and control the disease in prunes due to the cylindros porum.

The method of preparation is as follows: Prepare the copper sulphate solution in the usual proportions of one pound to the gallon of water, dissolve one and one-half pounds of common glue in one and one-half gallons of water, slack twelve pounds of lime, or stir twelve pounds of hydrated lime in water at time of using. Fill a 200 gallon spray tank three-fourths full of water. Pour twenty-four gallons of bluestone solution into the tank, start the agitator and add the lime milk slowly until a neutral solution is had. Test with litmus paper to tell when the solution is neutral. Add the one and one-half gallons of glue solution. Measure out twelve gallons of the General Chemical Company's No. 1 oil emulsion, or a corresponding oil emulsion, add a little water and stir until emulsion is started as shown by the mixture turning milky. Pour into the spray tank and add water to make 200 gallons. The agitator must be kept running during the whole procedure. The spray should be applied as soon as prepared.

The above are the proportions for a 200 gallon tank. In making stock solutions for a day's spraying the quantities given can be multiplied by the number of tanks required.

The strength of the Bordeaux can be varied as deemed necessary. The amount of copper sulphate in the above formula is the same as the ordinary 6-6-50. It is necessary that the Bordeaux solution be neutral and not alkaline as Bordeaux is ordinarily made. This is determined by adding the lime milk slowly allowing the lime milk and copper solution to be well mixed and testing with blue or red litmus paper to determine when the neutral point is reached.

If no rain follows the application of Bordeaux oil emulsion spray for 24 hours, the spray dries thoroughly and stays on the bark of the trees throughout the season, and is effective against anthracnose development after the fall rains begin.

THE ALFALFA WEEVIL AND METHODS OF CONTROLLING IT

By Geo. I. Reeves and Philip B. Miles, Entomological Assistants, and Thomas R. Chamberlin, Sterling J. Snow and Luther J. Bower, Scientific Assistants, Cereal and Forage Insect Investigations

The alfalfa weevil destroys a great deal of alfalfa in northern Utah and southern Idaho. It also inhabits southwestern Wyoming and is spreading slowly to new territory in all directions. It may in time infest most of the United States. The adult (fig. 1), a small brown snout-beetle, and the larva (fig. 2), a green, worm-like creature, usually escape notice during the first two or three years that they are present in a locality, but as soon as they become numerous enough to do harm they are readily found, and their effect upon the appearance of the fields is conspicuous. Vigorous treatment is then necessary to prevent partial or total destruction of the first and second crops. The purpose of this bulletin is to show how serious the attack is to the farmer, how much territory it embraces and how it spreads, and to describe the insect, its work, and the methods which are effective in dealing with it.

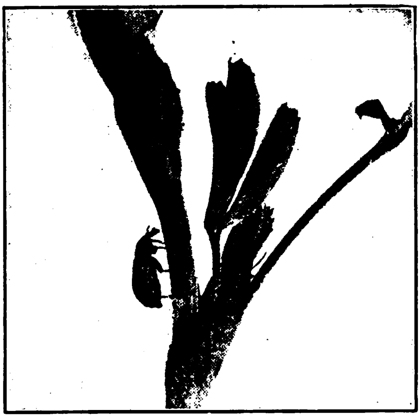

Fig. 1.—The alfalfa weevil: Adult. Enlarged. (Original.)

Importance of the Alfalfa Weevil as a Pest

This insect attacks Utah's most important crop. Alfalfa furnishes 80 per cent of the value of the hay and forage of the State, which in turn is 40 per cent of the value of all crops. The 1909 crop was worth nearly $6,000,000.00.*

About one-half of the annual yield is harvested in the first cutting and about one-third in the second. The damage to the first cutting ranges from slight depreciation of the quality of the hay to almost total loss, varying according to the rate of growth and the time of harvest; it may be estimated at 50 per cent. The damage to the second cutting, if no effort is made to prevent it, amounts to total loss. The menace to this State, therefore, involves one-half of the yield, worth $3,000,000.00.

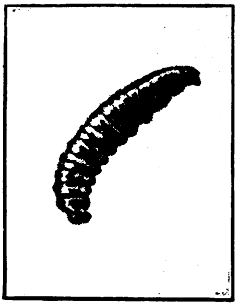

Fig. 2.—The alfalfa weevil (*Phytonomus posticus*): Larva. Much enlarged. (Original.)

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* Thirteenth United States Census.

Besides the loss represented by these figures, there is a less tangible but equally serious effect due to the peculiar relation of alfalfa to western agriculture. Because of its ability to revive after prolonged drought, to produce abundant crops for many years without reseeding, and to furnish a nearly complete ration for livestock, it has a very great value for a region where the water supply is scanty, reseeding expensive and difficult, and livestock an important and increasing source of wealth.

The Infested District

The infested district (fig. 3) reaches north from Salt Lake City to Rosette, Utah; Strevell, Malad City, and St. Charles, Idaho; and Cokeville and Granger, Wyo. It extends south to Moroni and Oasis, Utah. These points lie near the rim of a circle about 100 miles from Salt Lake City. Eastward the weevil has gone only about 50 miles to the Uinta Mountains and westward an equal distance to the Salt Lake Desert.

Spread of the Weevil

Both the outline of the infested district and the history of the spread show an average seasonal advance of about 10 miles per year since 1904 or 1905, when the insect was discovered by farmers at Salt Lake City. There are no isolated colonies distant from the main body, and there have been no long jumps in the movement. If wagons and railroad trains have carried weevils it has evidently been only for short distances. As has been predicted,* their spread has been largely by crawling and flight. The greatest progress has been along certain wagon roads, rather than in the direction of prevailing winds, railroads or streams. This point is well illustrated by the road to St. Charles, Idaho. Here the insect has gone 100 miles along a main road, across mountain ranges, regardless of prevailing winds and far from railroads.

That no one knows exactly how the weevils spread, may be inferred from the conflicting quarantine regulations designed by uninfested States to exclude them. Thus, Arizona forbids the importation of nursery stock; California requires its fumigation at origin and delivery and forbids packing with hay, straw or rushes; Montana requires official fumigation at the point of origin; Oregon forbids the use of rushes and forage plants as packing; Arizona prohibits the importation of fruits; Montana, the importation of both fruits and vegetables from April 1 to October 31, except such as are inspected at designated points by the State of Utah from August 1 to October 31. Arizona and Oregon prohibit the entrance of alfalfa seed; California and Idaho require it to be fumigated by an official after arrival; and Montana requires it to be so fumigated before shipment. Hay and straw of all kinds are barred by all five States. Bees in hives are refused admittance by California and Idaho; and Oregon requires that they shall not be packed in rushes, weeds or forage. Household goods must be inspected before shipment into Arizona. Livestock can be shipped into Arizona only with the consent of the State entomologist and must be transferred to clean cars before crossing the line. California and Idaho prescribe

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* Utah Agricultural College Extension Department Bulletin No. 1, 1909.

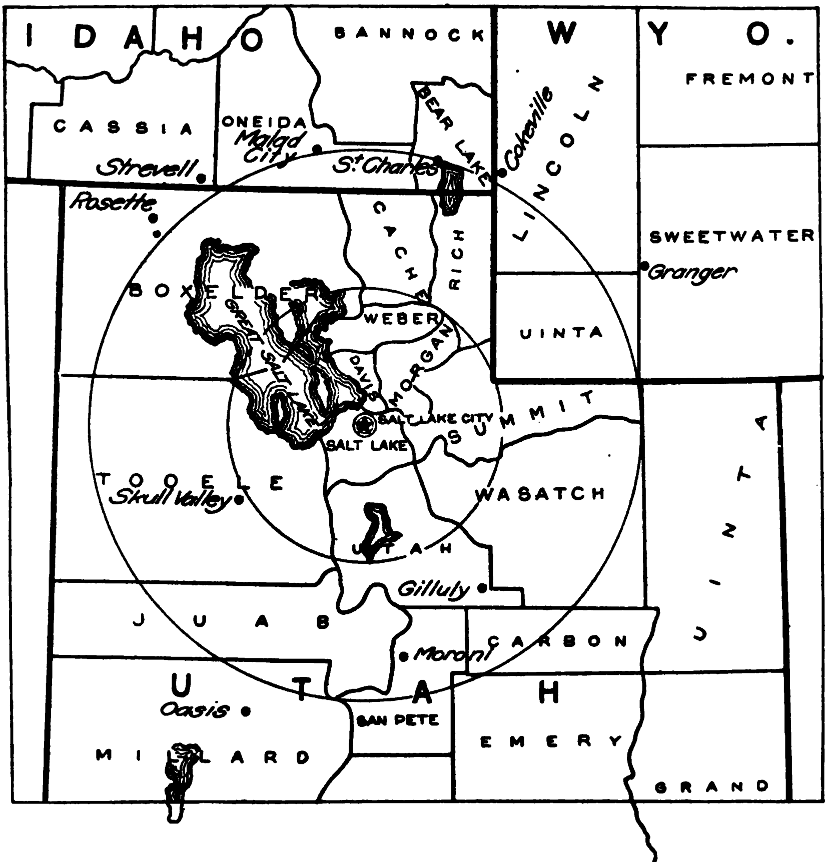

Fig. 3.—Map of portions of Utah, Wyoming and Idaho, showing the district infested by the alfalfa weevil. The circles are 50 and 100 miles from Salt Lake City. (Original.)

that hay and straw must not be used in cattle cars, and Oregon forbids also grass and forage crops. Grain is barred from Arizona. Colorado, Wyoming, New Mexico and Nevada have no restrictions on account of the alfalfa weevil.

In spite of the contradictory popular ideas of the means by which the alfalfa weevil travels, many facts which bear upon the question are definitely known. Live weevils do not occur in alfalfa seed, either before or after it is recleanded. They are seldom found in nursery packing of any kind, fruits and vegetables, or hay and straw used for packing, bedding or feed, except under the following conditions: They are often found in green alfalfa fresh from the fields and in second crop hay and potatoes which have been handled in contact with it; and they are found also in cured alfalfa hay, especially hay of the second cutting, in the stack, where some of them remain alive until the end of the following winter. They are found for several hours afterward in clothing which has been worn through infested fields in summer time, and sometimes remain even after the clothing has been packed in a trunk and shipped as baggage.

The occurrence of weevils in green alfalfa hay and new hay of the second crop is particularly important, because potatoes which are to be shipped are often hauled to the car upon a bedding of it to prevent bruising and are sometimes covered with it to protect them from the sun. This hay usually contains weevils, which crawl from the alfalfa to the sacks and are loaded into the tight refrigerator car, in which they often remain until it reaches its destination. Although no colonies have yet been started by this means, there is constant danger of it, which can be minimized by simply keeping the hay away from the potatoes.

Another important consideration as to the occurrence of weevils in new hay is that many people driving through the country in summer carry it for short distances as feed for their horses. The weevils may leave the hay as a result of the jar of travel, according to their habit; and that they do so is the more probable because no colonies have been found at any distance from the main territory, as would have happened if they were carried long distances by wagon. There is, however, a constant stream of traffic over certain main roads, composed of sheepmen, peddlers and others bent on business or social visits to other localities, near or remote. The carrying of weevils by these people, even if it be but for a mile or two, amounts in the aggregate to a systematic relaying of the species over through routes. There seems, in fact, to be a relation between the localities where alfalfa from infested fields is carried in this way and the country over which the weevils have spread most rapidly.

No connection can be traced between the railroads and the actual spread of the alfalfa weevil; in fact, the advance of the weevils has been rather less rapid along some railroads than in certain regions remote from them. The weevils occur rarely in baggage, express and freight cars, and somewhat more often in passenger cars and refrigerator cars containing potatoes which have been handled with fresh second crop alfalfa hay. Although there has been a large volume of unrestricted passenger traffic from the infested region during the past twelve years, no colonization of weevils has resulted; and although weevils have traveled in potato cars as far as Denver, Colo., Rock Springs, Wyo., and Butte, Mont., and many cars of potatoes which doubtless carried weevils were shipped throughout the western states, no colonies have been started by this means.

The transportation of weevils on railroad trains and wagons is little affected by the flying of the species. It seemed reasonable at an early period of the investigation to believe that a beetle which flies abroad in the summer would alight upon various commodities and vehicles and be carried for great distances, but such is not the fact. Weevils are rarely found on trains or wagons except in cases where new hay is involved. The flight of the weevil not only plays a small part in its distribution by wagons and trains, but it is less general and extensive than it was once supposed to be. All records which are definite and authentic show only small numbers of the weevils in flight at any time. Reports dealing with immense numbers swarming in the air usually mention no specimens at all as actually caught, identified and counted. They do not agree with the observations of this bureau, and many of them are probably based, by mistake, upon some other insect, such as the dung beetle, Aphodius, which resembles the weevil in appearance and is always present in the air in larger numbers than the latter.

There is no evidence that the weevils ever fly for the purpose of seeking fields of alfalfa, either new or previously infested, or to find hibernation quarters. The most plausible theory is that their flight is caused by a rise in temperature, as are many activities of the lower animals. So far as can be learned, this flight is at random. It takes some of the weevils into new fields.

The crawling of the larvae is unimportant as a method of spread, being limited to a journey of a few feet from one field to another, but the crawling of the adults is an important matter. During the cold weather of spring and fall a day's journey of an adult weevil is only a few inches, but during the warm months the adults crawl during the greater part of the day or, in July and August, of the night. Although they use up much of their energy in climbing up and down plants, and into and out of crevices in the ground, so that it is largely wasted so far as progress is concerned, a little of it happens to lead

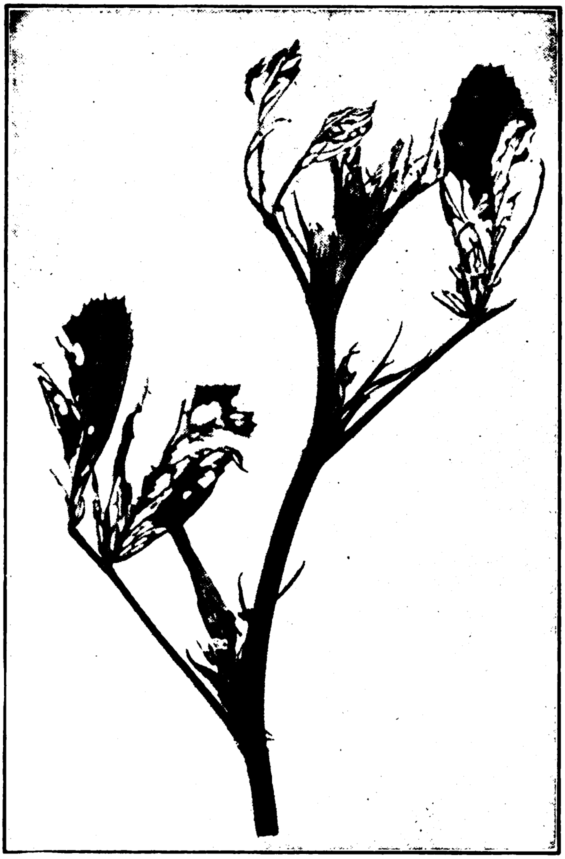

Fig. 4.—The alfalfa weevil: Work of the larvae. (Original.)

to new fields. There is no general movement by crawling, any more than by flight, from the fields to the ditch banks, fence rows, and similar places, or from such places to the fields, at any time. The crawling is most important, as has been shown, in bringing weevils into hay and so into traffic, which probably takes them somewhat farther than they could go without help.

During the twelve years that the alfalfa weevil has been in America it has spread into new territory very slowly and has agreeably disappointed those who feared that it would extend rapidly over all the alfalfa producing regions of the continent. Its progress is so slow that there is hope of providing control methods for new climates and conditions as fast as these are encountered. There is hope also that the pest will not prove equally injurious under all circumstances. It is much less harmful in Europe than in America, owing apparently to climatic and industrial conditions, and it multiplies more slowly and does less damage in the higher altitudes in Utah and Wyoming than in the lower valleys. Nevertheless, it is possible that eventually every section of the country will have to consider, first, the problem of keeping the insect out of its boundaries, and later, the problem of growing alfalfa in spite of the weevil, or finding a substitute for that valuable crop. It is therefore particularly desirable that farmers in the western mountains and plains should learn the appearance of the different stages of the weevil and be prepared to protect their crops.

DESCRIPTION OF THE WEEVIL IN ITS DIFFERENT STAGES

The Full Grown Larvae

The insect is most easily discovered, during the early years of its presence in new fields, in the form of the full grown larva (fig. 2). It is then a green worm-like creature one-fourth of an inch long, with a black head and a faint white stripe down the middle of the back, and it feeds upon the leaves of the alfalfa mainly during late May, June and early July. It can be found by sweeping the tops of the plants with an insect net, or by looking for the notches in the leaves where it has fed. When the larvae are numerous they destroy most of the tender growth (fig. 4), causing the tops to appear white and making the field look at a distance as if frostbitten.

The Newly Hatched Larvae

The newly hatched larvae are harder to find. They are only about one thirty-second of an inch long and remain hidden in the partly unfolded tips of the plants, where they are not easily seen or caught by the net. Their color is yellowish green, excepting the head, which is black. The color changes to green at the first molt, or shedding of the skin, and there is little change except in size during the two or three molts which follow, varying in number with the season of the year in which the larval life is spent.

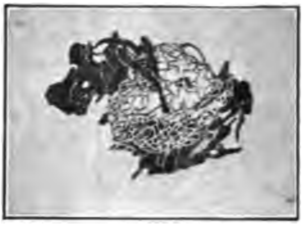

Fig. 5. — The alfalfa weevil: Cocoon attached to dead leaves. Much enlarged. (Original.)

The Pupae and Cocoons

The pupal form is the one in which the change from the larva to the adult takes place. The pupa is contained within a delicate oval, netlike cocoon (fig. 5), woven of a few white threads and attached, sometimes to the lower part of a green stem, sometimes to rubbish on the ground, and often to the inner side of a curled dead leaf. The pupa within this cocoon is somewhat like the larva in color, but more like the adult beetle in form, becoming still more like it in both respects as it approaches maturity.

The Adults

The adult is harder to find than the larva, but is present in the field throughout the whole year instead of the summer only. It is an oval brown beetle, three-sixteenths of an inch long, with a prominent snout projecting downward from the front of the head. The color of old, weathered specimens is nearly black, owing to the dark ground color revealed by the shedding of the brown and yellow scales which at first clothe its upper surface. The adult stays close to the ground during early spring and late fall, but climbs about in the tops of the plants during the warm season. It is not readily seen by one walking through the fields, because it habitually drops to the ground when disturbed, and its color helps to make it invisible. It can be captured during the warm weather by sweeping the plants with a net and during the cooler spring and fall weather by sitting quietly in the field and catching it when it moves on the ground. In the winter it can be found by digging about the crowns and roots of alfalfa plants.

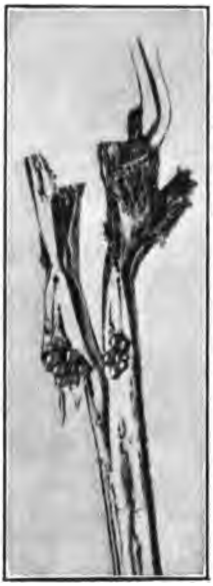

Fig. 6. — The alfalfa weevil: Eggs in split green stem. Enlarged. (Original.)

The Eggs

The eggs (fig. 6) are less conspicuous than the larvae and adults, because they are usually concealed within the steams of the plants; but the holes in which they are placed are found in large numbers by examining the green stems during May and June, and in smaller numbers as early as March and as late as December. The eggs are small, oval, shiny globules, bright yellow when first laid, but dingy after a few days when incubation has begun and adorned during the latter part of the incubation period with a black spot where the head of the little larva shows through the transparent shell. A few eggs, some of them infertile, are laid on the outside of the plants, and more in the weeds and grasses which grow in the field. Late in the fall and early in the spring there are many in the dead stems on the ground.

When an alfalfa grower outside the territory known to be infested finds in his field any insect which he suspects to be a form of the alfalfa weevil, he should send it to the Bureau of Entomology Field Station at Salt Lake City, Utah, to be identified. If it proves to be the alfalfa weevil, it is important that work should begin without delay, so that the measures that will be effective in controlling the pest under the new conditions may be learned. This work requires study of the traveling, feeding, mating, and egg laying habits of the insect; of the effect upon it of climate, crop conditions and farm operations; and of the agricultural conditions of the region, in order that the conditions favoring the growth, increase, and work of the weevil and the conditions necessary to destroy it or hinder its work may be ascertained. So far as these things are already known in regard to the country now occupied by the weevil they are here set forth.

HABITS OF THE WEEVIL

Where and How the Weevils Pass the Winter

When cold weather comes on the adult weevils creep down close to the ground and into crevices and spend the winter there. Some ditch banks and other uncultivated places which are strewn with the litter of dead vegetation harbor many of them, but these numbers are an insignificant part of those which remain in the fields and deposit eggs the following spring. Burning the grass and weeds in such places, therefore, while desirable in itself, gives practically no protection to the crop in neighboring fields.

Many weevils die in the fields during zero weather, but milder winter temperatures seem to have little effect upon them. Since bare ground freezes more than that which is covered by snow, it is sometimes advisable to cultivate the field in the fall, so that the snow which falls upon it may melt and expose the weevils as much as possible to the cold.

Owing to the fact that most of the weevils spend the winter on the ground in the fields, it is possible to kill them by flooding the field with muddy water and thus covering it with sediment.

There is no definite hibernation in this species. The adults are quiet when it is cold and active when it is warm. A female taken from the frozen fields will feed immediately and oviposit in a few hours after being brought into a warm room.

Early Spring Activity of the Weevils

The readiness with which the weevils resume their activities when subjected to warmth has an important bearing upon control measures. The weevils lay scattered eggs in early spring, many weeks before the regular laying season, and deposit a number of eggs in the dry stems on the ground even before they begin climbing up the green plants and feeding upon them. Larvae hatching from these eggs, with those from eggs laid under simliar circumstances the previous fall, sometimes attack the plants in numbers large enough to cause serious injury to the crop before the majority of the eggs have been laid, particularly in years when there is an early spring. This early activity must be taken into account in any attempt to protect the first crop.

The fact that the adults feed rather freely for several weeks in early spring while the plants are small is the basis for attempts to destroy them by spraying with arsenical poisons. There is no danger of poisoning the livestock which may eat the hay, because the plants are too small at the time of spraying to hold much poison, and this early growth forms but a small portion of the hay crop. The amount of poison contained in hay from fields which have been sprayed only three weeks before cutting is too small to have any effect upon the most sensitive animals. The feeding of the adults is done chiefly after the usual time for the dormant spraying of orchards and before the early codling moth spraying, and therefore the work on the alfalfa fields need not conflict with either of those operations. Aside from its relation to spring spraying, this early feeding of the adults is chiefly important in that it gives the spores of Sackett's disease a chance to lodge within the tissues of the plant.* The damage caused by this blight is sometimes as serious as that done by the weevil larvae themselves and is generally confused with it.

Egg Laying of the Weevils in Later Spring

After feeding for several weeks, running about over the ground, depositing eggs in dry stems, and flying a little, the adults deposit large numbers of eggs in living stems. When the spring opens early they begin egg laying gradually, and the earliest eggs may hatch before the majority are laid. After a late spring the egg laying begins abruptly. In either case it is usually ended before June 10, and if the eggs can be destroyed up to that date, the attack of the larvae will be prevented for the year. This can be done by pasturing the first crop so as to destroy the eggs after they are laid and before they hatch, or, at latest, while the larvae are still small enough to cling to the leaves and be swallowed. This is the basis of the pasturing method and of a similar method of destroying the eggs and at the same time utilizing the first crop by cutting the alfalfa green and feeding it as a soiling crop.

Work of the Larvae in the First Crop of Alfalfa

If none of the treatments mentioned has been used, the larvae appear in large numbers about the last week of May, or earlier if the spring has been favorable, and eat the leaves, especially on the young shoots, so rapidly that the plant is unable to outgrow the injury. At this stage, or a little earlier, it is necessary to cut the crop regardless of its condition, in order to prevent severe and perhaps total loss. The results of spring cultivation show at this time. The fields which have been cultivated grow earlier and produce a larger yield before cutting becomes necessary than do those which have been neglected. A few of the larvae have finished feeding and spun their cocoons before even an early cutting. Most of the others spin during the month of June, though a few late larvae are abroad in the field until winter.

When the first crop is removed, if the ground is dry and the weather clear and warm, many larvae, pupae, and adults die as a result of exposure to the heat of the ground. This mortality is increased if the ground is cultivated in such a way as to fill the cracks, crush the clods and scrape off all remaining vegetation. This, in turn, is more easily accomplished if the soil has been kept in good condition by manuring and cultivation. The killing of the insects by heat is the foundation of the "brush drag" treatment.

Summer Flight of the Adults

The heat of the soil is also probably an important cause of that increase in the activity of the adults called the summer flight, which is greatest during the dry, hot weather beginning in June and ending in August. This flight accounts for the presence of many adults in grassy places and orchards, where they alight and find protection from the heat. It helps to restock fields in which the weevils have been killed and makes it necessary to repeat the treatment year after year, and on the borders of the infested district it contributes to the spread of the pest. The summer flight is not a general movement of the weevils from the fields to seek more suitable hibernation places elsewhere. There is no such movement, and virtually all of the weevils spend the winter in the fields.

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* O'Gara, P. J. Bacterial blight of alfalfa in Salt Lake Valley. *In* Science, n. s., v. 39, no. 1016, pp. 905, 906. 1914.

Work of the Larvae in the Second Crop

If no treatment is given the infested field after haying, the larvae which have been feeding upon the first crop gather upon the buds of the stubble, and although many have been killed by the heat of the earth after the cutting, there are still enough to prevent the sprouting of the second crop for a time nearly equal to its usual period of growth. By that time most of them have finished their feeding and growth and have gone into the pupal stage, and there is consequently no attack upon the later growth.

Activities of the New Generation of Weevils in Summer and Fall

At the time of cutting the second crop the fields are full of weevils of the new generation, and there are usually many more weevils in the second crop hay, which is cut at this time, than in that of the first and third crops. Their activity is greater at night than by day, and this condition contines until the cool nights of September begin. As Autumn progresses, they haunt the plants less and less and fortunately are nearly all on the ground before the threshing of the seed begins. No live weevils have ever been found in alfalfa seed.

About one-half of the females of the new generation of beetles are ready to deposit eggs by the middle of October, and egg laying, chiefly in dry stems, goes on for about a month after that time. Few of these eggs hatch before winter, and some of them hatch the following spring and probably take part in the early attack upon the first crop.

These habits of the weevil and the relations between it and the crop, the climate, and the country, comprise most of the facts for which a practical use has been found. Upon them are based all effective plans for preventing its ravages and retarding its spread.

RECOMMENDATIONS FOR THE CONTROL OF THE WEEVIL*

Silting

Weevils can be killed in late winter or early spring by irrigating the fields with very muddy flood water and so burying them under a deposit of fine mud. This is practicable only where the irrigation system is without a settling reservoir, which is in itself an undesirable condition, but in the few cases where it can be applied the process is simple and inexpensive and the results good.

Spring Cultivation

Alfalfa fields in a weevil infested region should be cultivated thoroughly in the spring with the spring tooth harrow, disk harrow, or a similar tool, provided the crop is valuable enough to warrant the expense of the operation. Under conditions where cultivation is especially desirable, as where water is scarce or the soil does not naturally retain moisture well, this may increase the amount of the first crop as much as 50 per cent. It will cost from 60 cents to $1.25 per acre. In nearly every case it will be necessary to go over the field at least twice; and if the soil is in such condition that a double harrowing does not pulverize the soil and kill the weeds and grass, systematic manuring, cropping and cultivation to improve the soil are desirable. Spring cultivation has no appreciable effect on the weevils, but merely hastens the growth of the alfalfa so as to give a larger yield when the attack of the larvae in May or June makes early cutting necessary.

Spring Spraying

As soon as the weevils begin feeding upon the leaves of the plants, which usually happens early in April, the field may be sprayed with from 50 to 100 gallons per acre of a mixture of arsenite of zinc and water, in the proportion of four pounds of powder in 100 gallons. Owing to war conditions it may be impossible to obtain this poison at the present time. Arsenate of lead has not so far proved successful as an early spring spray.

On several occasions when it was intended to spray fields in early spring, circumstances prevented it, and the spray was applied about May 1, after many larvae had hatched from the eggs and attacked the crop. In several of these cases the results were good, although the amount of foliage which must be covered is larger at this time than in early spring. Arsenate of lead, in the usual orchard strength of four pounds to 100 gallons of water, was as effective at this time as arsenate of zinc.

The attachment which is recommended for use with the hand pump or gasoline engine outfit for spraying alfalfa fields resembles the potato or beet sprayer. It is a horizontal pipe, three feet above the ground, fastened across the back of the truck of the power sprayer (fig. 7) or the wagon in which the hand pump is carried, and stiffened by lashing to a two by four scantling as long as the pipe itself. To provide for the attachment of the supply hose from the pump and the nozzles which distribute the liquid, the pipe is built up of 30 inch pieces of one-half inch galvanized iron pipe, coupled by T's, except at the middle, where a cross is used, and the ends are fitted with L's. Unless reducing T's, L's, and cross can be obtained, a one-half inch by one-fourth inch bushing must be used for each nozzle, and in either case the attachment is made by means of a short one-fourth inch nipple. The hose lead from the pump is attached by means of a hose coupling. There should be a stopcock between the hose coupler and the main pipe to cut off the flow and maintain pressure whenever it is necessary to stop spraying in order to clean or repair nozzles.

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* In the field tests of spring and fall cultivation and the dust mulch treatment the Bureau of Entomology has had the cooperation of the entomological department of the Utah Experiment Station.

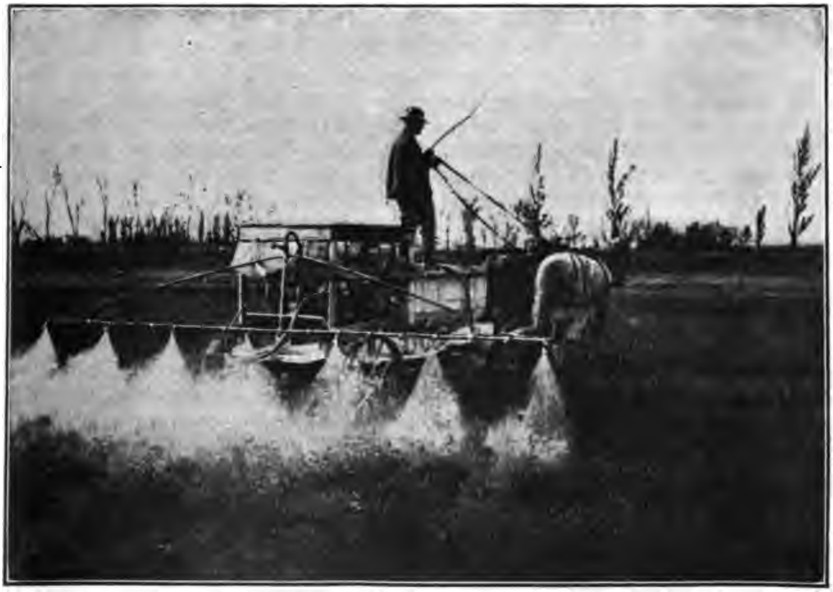

Fig. 7.—Alfalfa sprayer with power pump in use against the alfalfa weevil. (Original.)

The number of joints of pipe and nozzles to be used depends upon the capacity of the pump. A two and one-half horsepower engine and a good pump will supply seven nozzles of the eddy chamber type, with three sixty-fourths inch holes in the disks, and maintain a pressure of 150 to 200 pounds. Some hand pumps will hardly supply three nozzles. The nozzles are likely to become clogged, no matter how much care is taken to have the solution and the apparatus free from foreign particles. In addition to such precautions, therefore, it is wise to use nozzles provided with direct cleanouts at a slightly higher cost, as the time saved in operation makes up for the extra cost. Before work is begun, the tank, pump, hose, iron pipe and nozzles should be thoroughly cleaned to remove particles of rust, sediment and other foreign matter. The water and poison should be screened through fine brass strainer cloth. Attention to these details makes the difference between economical and expensive spraying, as clogging of the nozzles means costly delay for the entire outfit.

The cost of spraying with a power sprayer will depend largely upon the distance water must be hauled. It should range from 70 cents to $1.05 per acre when the usual price is paid for poison, the use of machine, the services of the operator, and the labor of the team and driver. Spraying does not take the place of spring cultivation in improving the condition of the soil and hastening the growth of the crop, nor does cultivation take the place of spraying in preventing the work of the weevils. The two operations are independent of each other, and in many cases both are desirable.

Pasturing

If spraying is out of the question, the first and second crops may be protected by destroying the eggs after they have been laid in green stems, or the small larvae after they have hatched and begun feeding in the tips, by pasturing the field. The success of this as a method of killing the insects depends upon managing the grazing in the right way and continuing it until most of the eggs have been laid; that is, until after the usual cutting time of the first crop. Instead of being pastured over the entire area at once, the field should be divided into two or three lots, with fencing suitable for the kind of livestock that is to be used, and the lots should be pastured alternately, so that each, after being eaten down close to the ground, will have a chance to grow up before the animals are turned in again. The number and size of the lots should be proportioned to the producing power of the field and the number of animals to be pastured, so that each lot may be grazed close to the ground about once in two weeks.

The pasturing may begin as early as the growth of the alfalfa will permit, and the change from each lot to the next should be made as soon as the larvae which have developed in the next lot begin to feed upon the plants. On the other hand, the change should not be made until the lot which is being pastured has been grazed close. The number of animals which are necessary is regulated by these requirements, varying at different times with the rate of growth of the alfalfa. It may sometimes be advisable, when the stock has eaten most of the lot clean, but allowed the plants to grow tall in certain spots, to mow these spots rather than to compel the animals to graze them.

The work may be considered finished as soon as most of the weevil eggs have been laid, which means a little later than the usual cutting time of the first crop. A good, practical method of deciding this question is to continue the pasturing until the lot containing the oldest growth continues free from signs of larval feeding past the time when the appearance of larvae is to be expected, according to the experience of the season.

The area which can be protected from the weevils in this way is limited by the amount of livestock available. Three and one-half acres of rather poor alfalfa handled in this way will support from forty to fifty 60-pound hogs, or a corresponding number of other animals.

According to the statements of agricultural experts, this way of preventing weevil injury deserves more notice than its usefulness for that purpose alone warrants, owing to the fact that, when combined with the proper feed of grain, alfalfa pasture furnishes an economical method of fattening livestock. Many farms would probably be more profitable if their management centered about the pasturing of stock on alfalfa, with the growing of enough other crops to provide grain and forage throughout the year. This is a matter that each must work out for himself to suit local conditions. Wherever the pasturing method is practicable it will solve the alfalfa weevil problem.

Soiling

Cutting the alfalfa green two or three times during the season and feeding it gives results similar to those of pasturing. It is especially suitable for dairy farms.

The Dust Mulch

If the weevils have not been killed earlier, they may be destroyed after removing the first crop by removing nearly all the vegetation, crushing the clods, and filling the cracks so as to expose the entire surface of the field to the sun. This is best done by such cultivation as will cover the field with a dust mulch, the dust being an additional means of killing the weevils which escape the heat of the ground. Success depends largely upon doing the work when the ground is dry and the weather warm and bright. It should not be attempted in cold, cloudy or wet weather, nor soon after irrigation.

Dragging the field twice with a brush drag is sufficient if the soil is already mellow, but most fields need one or two cultivations with the disk or the spring tooth harrow, and some grassy fields with heavy soil can not be put into the best condition to kill weevils until after they have been systematically improved for several years. A tool which is used instead of the brush drag in Salt Lake Valley is built by stretching several layers of heavy woven wire fencing under an ordinary spike tooth harrow with the teeth laid flat, and adding enough weight to pulverize the soil.

The dust mulch method has practically no value as cultivation, since it must be followed by irrigation, which packs the surface dirt and restores it to the condition which obtained before cultivation. Its value depends entirely upon the fact that it kills the insects and so permits the second crop to grow. It is open to the objections that it requires time and the labor of men and horses during the busiest season of the year and that it stirs up the stones on rocky fields.

Summer Spraying

Many farmers have sprayed the stubble after removing the first crop, with results about equal to those of the brush drag treatment. The same apparatus can be used as for the spring spraying, but the usual method has been to distribute the spray through two leads of hose and two Bordeaux nozzles, each handled by a man who walks behind the outfit or rides upon it and covers the ground as evenly as possible and as far as he can reach with the spray rod. Both Paris green and arsenate of lead, in the usual orchard strengths of one pound and six pounds, respectively, per 100 gallons of water, have been successful.

This treatment is more rapid than the brush drag method, but it requires special machinery. For orchard districts it is very promising.

Puddling

Several farmers have protected the second crop by dragging the stubble, while it is still wet from irrigation, with the land leveler or the clod breaker. This process embeds the insects in mud, in which they perish, and effectually prevents them from attacking the sprouts. It is easier than the dust mulch method, but it is harmful to the soil and is not recommended.

Prevention of Spread

Equally important with the problem of coping with the weevil in the fields is that of preventing its spread into new territory or, at least, since that may be impossible, of giving it as little help as possible. Aside from the consideration that the prosperity of each section depends largely upon that of other sections, the spread of the weevil from one district to others is a distinct detriment to the former as well as to the latter in that it increases the distance from which hay for feeding purposes must be shipped and consequently increases its cost.

All commodities which are to be shipped or hauled out of infested territory should be kept from contact with growing alfalfa, and they should at all times be kept away from new alfalfa hay, particularly that which has been cut during July and August.

Summary of Recommendations

The first and second crops of alfalfa can be protected from the alfalfa weevil by spraying the young growth in early spring, by proper pasturing, or by cutting and feeding the crop before the eggs in it have hatched, and in a few cases by covering the field with silt in early spring. The growth of the alfalfa can be stimulated and a larger yield obtained by cultivating the field in the spring. The second crop can be protected by spraying the stubble or by the dust mulch treatment.

Care should be taken to avoid spreading the weevil by shipping out of the infested district either new alfalfa hay or articles which have been in contact with it or with growing alfalfa.

THE ALFALFA WEEVIL CONFERENCE

April 1, 1919.

Gentlemen:

Following the weevil conference at Portland, I have taken the liberty of preparing a brief report on it, of which, due to the informal nature of same, no official record was made. The report consists of:

1. A brief resume of the life history and control as given by Mr. Reeves.
2. The resolution as adopted by the conference.
3. Some suggestions I have prepared for your consideration toward possible future action against this serious alfalfa pest.

I.

Distribution. Most of the cultivated areas of Utah; forty acres in Delta County, Colorado; three counties in Southwestern Wyoming; in Idaho: eastern tier of counties north to St. Anthony, southern tier of counties west to area of about twenty miles square about Payette.

Injury. Capable of destroying one-half yield where no control measures practiced. May reduce first crop by nearly one-half and take all of second.

Control. Three approved methods: 1. (Least important.) Pasturing through spring and early summer. Get good second crop. So much stock required to pasture effectively, essential that additional grazing land be available. 2. (Most widely practiced.) Cut first crop early, i. e., when seriousness of infestation requires, then drag field and prepare as dust mulch. 3. Spraying with arsenical poisons; simplest, least expensive and from farm management standpoint most practical, Apply spray ten days before normal time of cutting first and most valuable crop, saves second crop. Beneficial, results promising, but as yet only in experimental stage.

Quarantine. (Summary of discussion.) Probably can hardly be considered as a measure capable of protecting uninfested areas from eventual attack by the weevil but of value as an educational feature and as a measure of decided importance in delaying its arrival. Consensus of opinion was favorable to quarantine and resulted in the adoption of the following resolution:

II.

"Be it resolved by this conference of entomologists and quarantine officers of the States of Oregon and Washington, meeting at Portland, March 22, 1919, to consider the alfalfa weevil situation: That it is the consensus of opinion of the members that quarantine be established based on the details worked out at the quarantine convention held at Salt Lake City in June, 1918."

A unanimous vote of thanks was extended Mr. Reeves for kindness in coming out to address us and for the clarity and logic of his discussion.

III.

I hestitate to add anything to the discussion of this question and certainly do not pose as an authority on the alfalfa weevil. I do feel that the alfalfa weevil, affecting a group of states as it does, is properly a federal rather than a state problem. I am inclined to believe if the states interested were to unite upon the policy of federal aid, and make our wants known, it would be possible to create a more favorable attitude in the bureau at Washington, and to enlarge the scope of and place the alfalfa weevil investigation on a permanent basis. At present there is an insufficient force of men and funds to properly carry forward the work. Assistants are not permanently located on the problem. Finally, I would say that should such a plan of cooperative action seem advisable it would seem highly desirable to have Mr. Reeves advise as to the number and disposal of men and the amount of the fund to recommend. Too many men or too much money may react unfavorably against a most worthy project.

My plan would include recommending the following:

1. A survey by trained federal men of all possible areas where infestation might occur; the platting of the infested areas which, with a report as to the distribution, infestation, etc., would be sent each state entomologist and head of the state quarantine office in the interested states.

2. The formulating of uniform state regulations regarding new infestations, permitting the adoption of rather drastic control measures by federal men, seeking thus to effectually check and practically eliminate these new areas of infestation as they appear.

3. The development of a plan of education, through the press, by field demonstration, etc., seeking to have improved control measures uniformly practiced in infested areas and an awakened public interest in possible new infestations and the prompt reporting of possible outbreaks.

4. The apportionment of sufficient men and funds to carry forward the survey work, the demonstrational work, the investigational work, including prarasite breeding and distribution, spraying, etc.

Is there not some feasible plan by which the interested states of the northwest through the proper authorities can unite behind this or a better plan and increase the effectiveness of the present work against the weevil?

Sincerely yours,

A. L. LOVETT, Entomologist.

THE POTATO EELWORM

By A. L. Lovett, Professor of Entomology

The potato eelworm or nematode worm has recently been found infesting potatoes in Oregon. This most serious of potato pests attacks the tuber itself, causing the skin to become roughened and cracked and covered with irregular galls, malformations or pimples over the surface. Badly infested potatoes shrivel to one-half the normal size, become soft, lack nutrition and are unfit for human consumption.

Eelworms are not insects. They belong to the round worms or Vermes and are much lower in the animal scale than are insects. They are microscopic in size and their presence can be determined only by the characteristic appearance of the injured tissues. There are very few cultivated crops not subject to attack by this pest. Practically all garden and truck crops, many of the field crops and a great variety of fruit, shade and ornamental trees, shrubs and plants are attacked. The typical injury is a galling of the rootlets, known as root knot, root gall, etc. These irregular enlargements may occur at any point on the main and lateral rootlets. Affected plants appear devitalized, wilt and die.

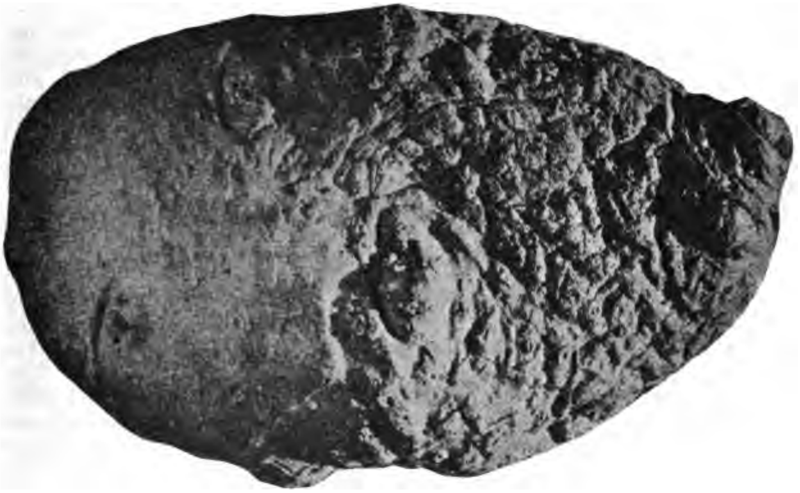

Fig. 1.—Potato showing characteristic pimples caused by Eelworms. (After Doten.)

The injury to the potato is more obscure but no less serious. The active worms tunnel inside the tissue of the potato tuber to a depth of one-fourth inch or more. Here they form cysts surrounded by an area of brown, dead cells. These appear as brownish rings, corky in texture and with a shiny, pearly white center. The skin of infested potatoes is usually wrinkled, there are irregular sunken grayish areas with a raised center here and there over the surface. Infested potatoes do not always show the same outward signs of infestation. Occasionally seed potatoes in the earlier stages will show no outward indication of injury.

Where obscure irregularities occur or where the skin is smooth it is necessary to examine the interior of the potato for the presence of the small brown areas of darkened tissue found at depths varying from just beneath the skin to one-fourth inch in the flesh.

Life History and Description

The eelworms occur in the infested soil as microscopic, threadlike, active creatures, less than one twenty-fifth inch long. When plants suitable for attack are present they batter their way to the interior by means of the lance-like arrangement of the mouth parts. When once located within the tissue, they become more or less inactive and commence to feed and grow. The growth is mainly in thickness and but slight in length, thus they gradually assume a spindle shape. After a period of about fifteen days the two sexes begin to show marked differences in form. The female continues to engorge, becoming a turgid, pear shaped cyst of a glistening pearly white in appearance. The male becomes an active wriggling worm, seeks out the female for mating and then dies. The fertilized female continues to increase in size, her body filled with eggs. These eggs, 400 to 500 in number, soon hatch, the active young worms working out into the surrounding soil to reinfest other plants or locating in new areas in the same plant.

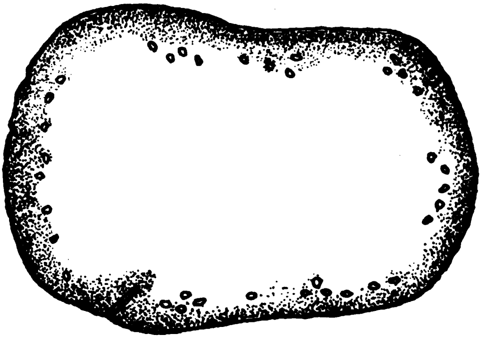

Fig. 2.—Cross section of potato showing appearance of eelworm cysts in the tissue.

Distribution

The eelworm is a pest of potatoes in the following localities: 1. In the irrigated sections of Nevada. Here the pest has practically ruined a very profitable industry. 2. In Southern California. 3. Unauthentic records indicate its probable presence on potatoes in Colorado and parts of Utah. 4. Infested potatoes have been received at the Oregon Experiment Station from Coos County, Oregon, near the town of North Bend.

As a field pest of other crops: Peaches, tobacco, tomatoes, gingseng, etc., the nematode worm is fairly well distributed over most of the known world. It is a more common pest, in the United States, in the south, but occurs generally east of the Mississippi River and at least occasionally in practically all parts of the country. It is a very common and injurious greenhouse pest.

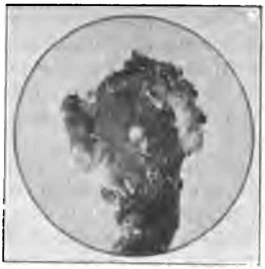

Fig. 3. — Eelworm cyst in situ in gall on tomato root, showing characteristic pearly center.

The eelworm may be distributed readily to new localities in the soil from infested fields or on the galled roots of any one of the many plants it infests. Nursery stock is a common means of distribution. All trees and shrubs should be examined carefully for irregular galls or knots on the roots.

Potatoes afford another ready means of distribution. Seed potatoes in particular constitute a real menace and should be subjected to a most rigid examination. Under no conditions should they be used where obtained from a locality known to be infested with the eelworm.

Control

If the potato eelworm is once established in a field only the most heroic measures are of avail, and at best total disinfection is probably impossible.

Seed Potatoes. Know the source of your seed potatoes and determine that they are from an uninfested district. Examine the lot carefully for suspicious tubers showing roughened, irregular pimples or galls on the surface. Select several representative tubers from the lot, whether any show outward signs of infestation or not, break them open and examine carefully (eventually breaking into many small pieces), for small brown spots in the tissue. These will occur at depths varying from just beneath the skin to one-fourth inch or more, and in size are one-half as big as a pin head, or even less, and with a pearly white center. Do not cut the potato; a knife blade will burst the cyst, which forms the pearly center, and ruin the typical appearance. If suspicious potatoes are discovered, send specimens to the Oregon Experiment Station or to some authority on potatoes, and do not plant seed while even a suspicion of possible infestation remains.

In the Field. It is folly to plant infested soil to potatoes. The crop will be injured and the soil more heavily infested. There are over 500 plants which are hosts for the eelworm. A number of the more common crops are seriously attacked and should, under no circumstances, be planted on infested soil. Therefore,

DO NOT PLANT

Field Crops

Alfalfa
Clover, crimson
Clover, red
Clover, white
Cowpea
Field beet
Field pea
Flax
Kale
Pumpkin
Rape
Soye Bean
Sugar beet
Tobacco
Vetch
Ginseng

Truck Crops

Asparagus
Bean
Cantaloupe
Carrot
Celery
Cucumber
Egg plant
Beet
Garden pea
Tomato
Lettuce
Muskmelon
Okra
Onion
Pepper
Potato
Salsify
Spinach
Strawberry
Watermelon

Trees

Almond
Catalpa
Cherry
Elm
Fig
Grape
Peach
Walnut

Many others, while not so seriously attacked, should not be used on infested land, if it is desired to lessen the numbers of the pest in the soil.

Fortunately, there are a few crops which may apparently be grown safely on infested soil. While not necessarily entirely immune they are not seriously attacked and are recommended for planting even where it is desired to rid the soil of the eelworm. It is doubtful if total disinfection is possible, but if plants of this class are used in a carefully planned rotation for a three year period, the pest will be very decidedly reduced in numbers, so much so that potatoes may probably be grown for a year. Therefore,

PLANT

Barley
Corn
Iron cowpea
Peanut
Pearl millet
Red top
Rye
Sorghum
Timothy
Velvet bean
Wheat
Winter oats

It is believed that the eelworm is not generally distributed over Oregon and it is even possible that the infestation of potatoes is confined to a limited area in Coos County. The pest is too serious for us to allow general infestation of our fields to occur either through carelessness or ignorance. Let eternal vigilance be our aim and let every reasonable precaution be taken to prevent the spread of the pest to new areas.

THE POTATO TUBER MOTH*

By F. H. Chittenden, Sc. D., in Charge of Truck Crop and Stored Product Insect Investigations

For many years the potato tuber moth, known scientifically as Phthorimaea operculella Zell., has been the worst potato pest in California. It has now reached the State of Washington and Southern Texas and menaces adjacent States. This insect feeds also upon tomato, eggplant and tobacco, which do not, however, as a rule, suffer much injury. When it occurs on tobacco it is known as the splitworm.

The mature moth of this species, which is quite small and grayish in color, is shown in figure 1, a; the larva is shown in b and c; and the pupa in d. Sizes are indicated by the size lines in the figure.

The eggs may be laid upon the leaves or on other parts of the plants, and the minute caterpillars or worms quickly bore between the surfaces of the leaves or into the potato skin, which they mine in every direction, finally devouring the exterior. It is believed that there are two or more generations in the course of a summer, and certainly another one can be produced in store. It thus happens that this insect belongs to both truck crop and stored product insect pests.

An example of injury by this species to potatoes is shown in figure 2. At a is a section showing the eggs; at the left is a section of a badly infested potato containing two pits, d and f, in which the larva has been at work, while at b and c is shown the egg, highly magnified. Figure 3 gives an exterior view of a potato which has been destroyed by the tuber moth.

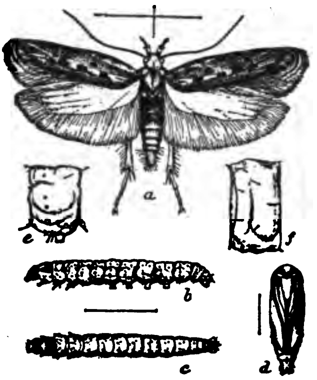

Fig. 1.—The potato tuber moth (*Phthorimaea operculella*): *a*, Moth; *b*, larva, lateral view; *c*, larva, dorsal view; *d*, pupa; *e*, *f*, segments of larva, enlarged. (Redrawn from Riley and Howard.)

Distribution

This species is widespread in its distribution, but in this country, until the year 1912, we did not know of its rapid dissemination. Abroad it is well known in Hawaii, all portions of Australia, New Zealand, Algeria, the West Indies, Peru and many other countries, including Southern Europe. As an enemy to tobacco it has been known for several years in Florida and in North Carolina, South Carolina and Virginia.

The species occurs in Southern California practically wherever potatoes are grown commercially, extending its range northward to the Sacramento Valley.

As an enemy to eggplant and ground cherry it has been observed as far north as the District of Columbia.

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* The account here given is issued with the purpose of warning potato growers and giving general information in regard to remedies. Work was begun on this species in 1912, and will continue. This is a revised and amplified account, first published as Circular 162 of the Bureau of Entomology.

The directions for applying remedies which follow are for the benefit of persons inquiring in regard to means of control. Which of these should be used can be best determined by trial in the different localities under the different conditions in which the insect exists. This applies especially to the question as to the best material for fumigation.

Evidence of Importance

As evidence of the importance of the pest Mr. J. E. Graf, working under the direction of the writer, wrote:

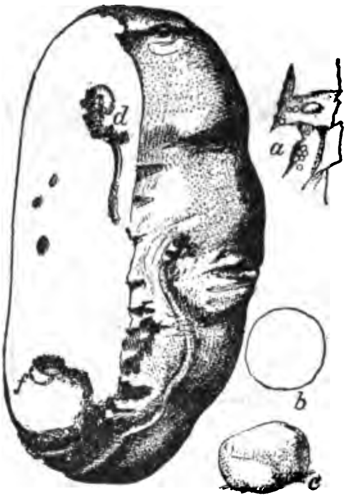

Fig. 2.—Work of the potato tuber moth: *a*, Section of tuber, showing eye and eggs deposited about it; *b*, egg in outline; *c*, egg, lateral view; *d*, *f*, mines of larva in potato. *a*, Natural size; *b*, *c*, greatly enlarged; *d*, somewhat reduced. (Redrawn from Riley and Howard.)

"In September, 1912, an unusual outbreak of this pest occurred at El Monte, Cal., due entirely to a combination of circumstances. Thousands of acres of potatoes were planted in Southern California — many more than the market would stand. This meant that the market was continually clogged and the prices were poor, so that the crop was worked off very slowly. The tuber moth (Phthorimaea operculella) is always found here, but the crop is generally handled so quickly and carefully that small loss results. This year, however, careless work and the leaving of potatoes in the ground too long have given the insect a tremendous start, and now its ravages are greater than ever before. A combination of the moth and low prices has so discouraged many of the growers that they are leaving their potatoes to rot, and as these are becoming infested there will be a great number of moths waiting for the fall potatoes. * * *"

Later, September 17, 1912, Mr. Graf wrote in regard to injury by this species that two growers near El Monte, Cal., lost $90,000.00 and $70,000.00, respectively, on potatoes that year. Items of this kind show the necessity of investigating the problem.

Aside from numerous similar complaints, including the usual number from California for the past two years, this species has been received from Eagle Lake and Hallettsville, Tex.; San Jose, Costa Rica; Seattle, Auburn and Yakima, Wash.; New York City, where it has not become acclimatized so far as known; Fort Collins, Colo.; and Larimore, N. D. These records include only occurrences on potato.

In the case of the last report the tuber moth was stated to have been imported into Southern California in potatoes from China. It is doubtful if the species has been established in North Dakota, but inquiries have been made in regard to the danger of its being introduced there as well as into Minnesota and many other States.

Remedies

The potato tuber moth is a difficult insect to control by any single method. It is not possible to reach the tuber worms in their mines in the potatoes or in the stalks or tubers while growing in the field, which makes it necessary to proceed against the pest by other methods. Of these, several must be employed to insure success.

Clean Methods of Cultivation

The first measure consists in the maintenance of clean methods of cultivation. This implies that all infested potato plants and solanaceous weeds, such as ground cherry, bull nettles, horse nettles and volunteer potato plants, growing in the same vicinity as the potatoes, must be destroyed. This can be done by prompt burning as soon as insect infestation is manifest. The burning of these weeds will eliminate places for the breeding of the insect or for its successful hibernation. Domestic animals, such as sheep and hogs, are valuable for the destruction of remnants and may be utilized by merely turning them into the field.

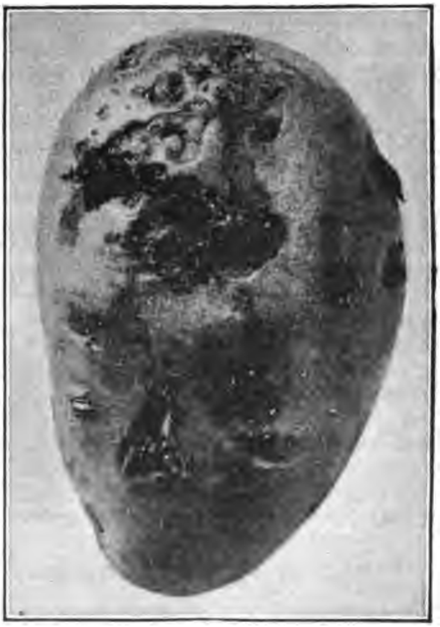

Fig. 3.—Work of the potato tuber moth. Exterior view of potato. (Original.)

Crop Rotation

As in most other cases of insect injury, crop rotation is desirable where possible, and the cooperation of all potato growers of the neighborhood is practically a necessity. In certain cases, as, for example, in a county where many potatoes are grown, it might be possible by legislation to enforce the discontinuance of potato planting for a year, requiring at the same time the destruction of the weeds which serve as food plants. There are several alternate food crops which do not suffer materially from this insect. About the best of these are leguminous crops, like beans, peas, cowpeas, alfalfa and clover. These possess a dual value, as they all act as soil restorers. Sugar beets, celery and crucifers are also good as alternate food crops. Grains may serve in the same way, as they are not attacked by the tuber moth.

Care in digging is advisable in order not to cut into the tuber or leave the dug potatoes in the field over night where reinfestation could occur.

Fumigation

While all of these remedies are of value, the best remedy is the fumigation of infested tubers with bisulphid of carbon or hydrocyanic-acid gas. If bisulphid of carbon is used, it should be at the rate of three pounds to 1,000 cubic feet of air space, including the potatoes; one ounce to a barrel of ninety-six pounds' capacity would not be excessive. With an exposure of not more than twenty-four hours no harm should be done to the potatoes for planting. The bisulphid should be evaporated in tins, like the pie plates or pie pans, and a cover should be placed on the top of the fumigating barrel or box so as to make it as nearly airtight as possible. At the end of twenty-four hours the potatoes should be removed, placed in a fresh barrel and closed up.

Where it can be conveniently done, hydrocyanic-acid gas should be used in a specially constructed fumigator (see fig. 4), also gas tight. In the case of bisulhpid of carbon there is great danger in bringing the chemical into proximity to fire, such as a lighted lantern or cigar, for the gas is highly inflammable and even explosive. Then, too, the bisulphid of carbon method costs slightly more than the hydrocyanic-acid gas method.

Fumigation with hydrocyanic-acid gas, properly performed, is not dangerous, but if improperly performed it is decidedly dangerous to human and other animal life, as the fumes are very poisonous and are deadly when inhaled in any amount. This gas is more penetrating than bisulphid of carbon and can be used by an intelligent person without trouble, if he first familiarizes himself thoroughly with the procedure by carefully studying the printed directions or assisting some one who has had experience in this work. The cubic contents of the receptacle to be fumigated, on which is based the amount of chemicals to be used, can be readily computed.

The fumigating box shown in the illustration, which will presently be described, may merely be taken as an example of what can be easily constructed to meet the purpose. In the case of this box the potatoes are best fumigated in bags, which can be piled one on top of another. If bins or other fumigators are used, the proportions will vary. They can be constructed longer or shorter and lower, according to the individual needs and desires of the potato grower.

The Construction of a Fumigator

A building, box or room (see fig. 4) of about 100 to 200 bushels, capacity suitable for the fumigation of a quantity of potatoes would contain about 500 cubic feet. A fumigator of this cubic capacity might be built eight feet square by eight feet in height. A good and perhaps the best means of preventing the escape of the gas is to line the fumigator with sheet tin, with soldered joints and over sheathing. Another method is to sheath the room inside, cover the walls, ceiling and floor with tarred or heavy building paper, with joints well lapped, and cover the inside with matched ceiling boards. The fumigator should always be equipped with a tight door in which the joints have been broken, similar to the door of a refrigerator or safe, and should close with two refrigerator catches against a thick felt weather strip, which should render it practically gas tight. Thus constructed it would furnish sufficient space for the fumigation of about 200 bushels of material. There would also be sufficient space for the application and diffusion of the carbon bisulphid, hydrocyanic-acid gas, or other fumigant from the top with a charge more than necessary for the quantity of potatoes treated.

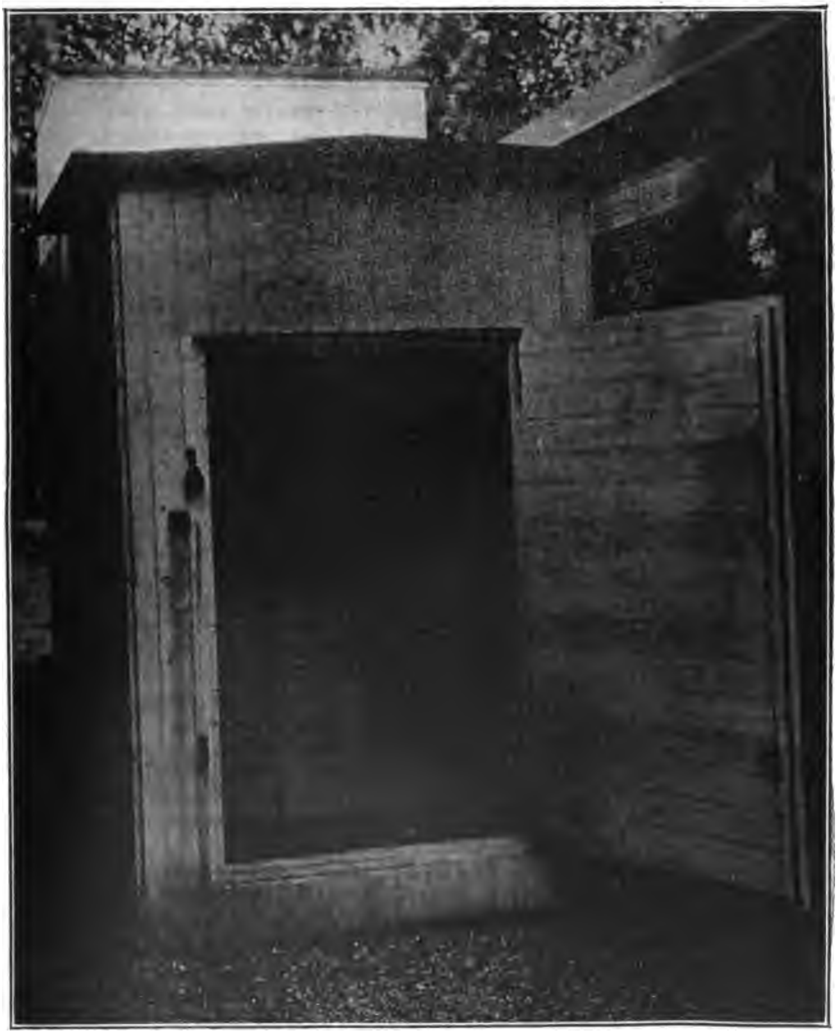

Fig. 4.—Fumigator used for stored products infested by insects. (Author's illustration.)

It sometimes happens that the price of potatoes is so low that the small grower can not well afford to expend the amount of money which would be necessary for the construction of a special fumigator. In such a case it would be advisable to use a barrel, preferably a large oil barrel, with a tight fitting cover for fumigating. It is possible also to fumigate, but not thoroughly, piles of tubers by covering them as tightly as possible with canvas, such as ten ounce duck or tarpaulin.

Protection of the Fall Crop and Seed Potatoes

A special letter of warning against the ravages of the potato tuber moth in the shape of a press notice has been sent broadcast to newspapers, as well as to growers, throughout the country. The main facts in the case were founded on the experience of Mr. Graf in his investigations and in his dealings with the potato growers of Southern California. Concisely stated, the warning is to enable potato growers to undertake special work with seed potatoes and with the fall crop.

For the protection of potatoes in fall against this pest it is urged that potato growers sort the potatoes for seed two weeks after digging and again two weeks later. The uninfested tubers should then be placed in a moth proof bin. The infested tubers may be readily picked out because of the excrement of the larvae which adheres by webbing to the outer skin of the potatoes. The tubers in the moth proof bin, after final sorting, should be fumigated with carbon bisulphid (bisulphid of carbon) to destroy any moths which might have bred out or have obtained entrance through other means. Growers should now keep a careful lookout both in the field and among the fumigated tubers. At first those which have been fumigated should be inspected daily. Afterwards observations may be made every other day until finally once a week will suffice. If there should be any indication that the tuber moth is propagating, a second fumigation is in order.

This method of saving seed potatoes appears so simple, although effective, that it is feared that many growers may disregard it.

To grow all potatoes successfully the farmer should work overtime on a cleaning-up campaign which should begin at once on receipt of this bulletin. Small or useless tubers and tops should be promptly cleaned up and burned, and the land should be harrowed to break up clods and leave as few hiding places as possible for the moths. All weeds and other plants of the potato kind should be destroyed over large areas surrounding the potato fields.

It is particularly urged that potato growers cooperate in this work, which will lessen very materially the numbers of moths and hence reduce the chances for propagation. Could general cooperation be secured by legislation or otherwise it would be possible to restrict the distribution of this species to the area which it now occupies or to stamp it out where now established. Slipshod methods of raising potatoes at such a time as midsummer or early autumn are particularly dangerous, and in infested districts it is advisable in many cases to raise some crop other than potatoes, because unless protective and defensive measures are adopted at once there will be a serious reduction of the potato crop and similar trouble will be experienced during seasons to come.

SEED POTATOES AND POTATO GROWING IN OREGON

H. H. Weatherspoon, Horticultural Commissioner Fifth District

Owing to the increasing number of pests and diseases affecting the growing of potatoes in the United States it seems now that it will only be a very short time until potatoes will be one of the higher commodities of our living, rather than a common food for all the people.

Thirty years ago potatoes could be grown successfully in practically all parts of the United States, while at the present time there is less than a dozen States that can really be counted in this list.

When the land does not produce in quantity sufficient to make it profitable, growers immediately change to growing such commodities as are more profitable, consequently they drop out one by one until whole States go out of the business.

In most cases it is not the fault of the land and not always the fault of the grower in not properly cultivating, but due to diseases that have gradually gained a foothold in the country, the grower not really knowing of its presence. In one county alone, I personally examined fifty fields of potatoes, every one of which was a failure more or less, on account of Fusariam disease, and in talking to the owners, found that in each case not one even suspicioned of his failure and was content to charge the cause to lack of moisture or other unseasonable conditions, even to the fact that the moon was not right when the planting was done.

Potato diseases can be scattered in one way only and that is by diseased seed. Dealers as well as seed houses in the State are permitted to offer seed potatoes for sale without practically any inspection whatever, and give no certificate or guarantee as to their being free from disease; in fact, the whole situation is treated in such a haphazard manner it is a miracle that we get along as well as we do.

No two growers seem to agree as to just how to grow potatoes and very little effort has been made so far to standardize any method that would in the main apply to all conditions and serve to direct the inexperienced as well as those better posted in the business.

Some growers insist on planting very large seed while others insist on small scrubby stuff, while as a matter of fact neither is right, but neither party will listen to the argument that there is a happy medium between these two extremes that would be beneficial to all.

Too much attention is paid to accidents rather than to what data the State has gathered in a scientific way. The grower who turned the sod in Kansas thirty years ago and planted his crop, had a bountiful supply of moisture and harvested a good return, made up his mind then and there that he had solved the problem of potato growing and has been going along since that time making failure year after year laboring under the impression that he knew from experience how to do it, rather than the man who has been carrying on scientific investigations for a hundred years.

One year or two years' success with a crop of any kind does not always mean that you are playing the game correctly, but when scattered over a number of years successfully the system is then worth following.

Free advice appears to be one very cheap factor in the beginning of the inexperienced, but a very dear lesson in the end.

To those who have not been engaged in the businesss and anticipate launching into same I would advise them to seek out the most successful grower in his locality. Consult him first as to the variety best adapted, then study his methods and follow out, as closely as possible, his manner of handling the crop, paying no attention to the man who is continually boring you with advice, notwithstanding they usually fail in their own crops.

In the matter of seed potatoes, it is an easy matter to make mistakes in variety as well as getting diseased seed.

Oregon not being a State that can compete with the warmer climates in the matter of early potatoes must be content to grow the medium early varieties of which at the present time we have three that can be grown successfully, two of which rate very high in flavor, the third medium in flavor, but a very heavy producer.

The Early Ohio probably has no equal in quality, but is slightly shy in production. Next to this comes the Red River Ohio which may be classed as originally an Early Ohio, but since being raised in the Red River Valley of Daktota and Minnesota has rather standardized itself into a distinct class of its own being rather longer than the Early Ohio with now and then a slight pinkish pulp similar to the Rose.

This potato has excellent quality and is a heavy producer, but about ten days later in maturing than the Ohio.

The Bliss Triumph for earlier potatoes can be grown very successfully and markets well for young potatoes, but for use as a cured potato is rather lacking in quality of flavor.

In late varieties the Netted Gems probably excel any yet discovered and can be grown successfully in any part of the State.

The Burbank for certain sections where irrigation is not used is grown very successfully, but can not be successfuly grown in irrigated sections. The rural types, of which there are many, can be grown successfully in any part of the State, but do not have the flavor of the Gems or the Burbanks, neither do they sell so well, but yield heavily.

The proper size seed for planting is the two or three ounce sized potato which should be split or cut once from one end to the other, making two pieces of same. If planting at a time when the soil is very dry and you can not irrigate your land it would be well to select all from the two ounce size and plant the potato whole, which will insure you a good stand.

Immediately after cutting your seed the same should be treated by dipping in a solution of corrosive sublimate of a strength of 500 to one, leaving the freshly cut potatoes in the solution one hour, then remove and dry quite thoroughly before planting. This will remove all fungus diseases from your seed and if your ground is free from potato diseases you will have a clean crop and add much to the yield by this process.

Formaldehyde has been pretty generally used in the past, but this treatment fails to remove the disease known as Rhizoctonia and which is sure to be present in some quantity, consequently the sublimate treatment is more effective and better.

Examine your seed for Fusariam disease. If you are not familiar with the disease, it is a very easy matter to determine if you have the same in your seed by cutting the potato about one-half inch from the end where the runner connected up with the potato.

If you find any dark circular rings in the potato which has the appearance of the potato going to decay, you may be sure it has the disease and any such potatoes when planted will give you very poor return, if any at all. In cutting your seed when these are found throw them out, otherwise you will be scattering the disease in your crop which will materially lessen the yield and once you have the disease in the soil it will take at least ten years of other kinds of crops to eliminate same.

In conclusion of this matter it is my recommendation that in the potato growing sections farmers join each other in engaging some one person to grow their seed for the following year, this seed to be examined during the growing stages for any symptoms of the various diseases and when harvested to be passed upon by some competent person as to correctness of variety and cleanliness from diseases.

It is believed by the writer that if some of our best growers would secure the lands necessary for growing blooded seed potatoes and engage in the business, growing same in quantities to make it worth while, that a very large business could be carried on at good profit and Oregon would also profit greatly by such an industry.

It is further recommended that all seed houses be compelled to submit to an inspector, to be furnished by the county in which they are located, all potatoes to be offered for sale as seed and they not be permitted to sell same until they have first been examined and certified to as being free from disease.

FACTORS CONTROLLING VIGOR IN FRUIT TREES

By C. I. Lewis, Chief Division of Horticulture

There can be no question of greater interest to fruit growers than that of vigor of fruit trees. By vigor we mean a certain vitality or balance of the tree, the balance which to be sure, may vary according to the age of the tree. A desirable vigor in a mature tree for example, will be a certain necessary vegetative growth coupled with high yielding qualities, that is, the production of heavy crops of large, very desirable fruit. The proper vigor will mean an absence of heavy shedding of fruit, poor pollenization, an absence of certain functional troubles such as little leaf, rosette, malformed prunes, for example, sour sap, winter kill, die back, fruit pit and others too numerous to mention. Proper vigor should mean an absence of the many tree troubles that are apparent this spring, such as sick prune trees, pears with dead tops or weak branches, etc.

To understand vigor of trees we must first have a knowledge of what is going on in the trees themselves; the vital processes which are at work. And on the other hand we must understand the relation of our orchard practices, such as tillage, irrigation, intercropping, fertilizing and pruning to the vital or development processes that are taking place in the trees.

For thirteen years the Division of Horticulture has been investigating the pollenization of fruit. We first determined the sterility or fertility of commercial varieties and then the mutual affinities that exist between these varieties of fruit. In this way we were able to determine to some extent what were the best pollenizers for our leading commercial varieties of fruit. These investigators brought out interesting points; for example, the sterility of the Spitzenbergs; the worthlessness of the Winesap, for example, as pollenizer; the necessity of interpollenizing the Comice. Later we discovered that the Lambert, Royal Ann and Bing were not only sterile but would not pollenize each other satisfactorily. In our investigations we were attempting to determine the cause of sterility and to find out if orchard practices in any way influenced this condition. Contemporaneously with these pollenization investigations we conducted fertilizer investigations in the Hood River and Rogue River Valleys. The results obtained from the use of nitrate were so startling that we started to analyze our results very carefully. We soon came to the conclusion that the small amount of nitrate that we added played a role perhaps greater than the mere adding of so much plant food. The trees became so greatly reinvigorated, the pollenization was so greatly influenced, the vegetative growth was increased, and physiological troubles gradually disappeared. In order that we might determine more thoroughly just what role nitrogen was playing in the development of our fruit trees, Doctor E. J. Kraus of the Oregon Experiment Station and Mr. H. R. Kraybill of the Pennsylvania Station started investigations at the University of Chicago. Doctor Kraus was on leave of absence for two years in order to take up this research problem. Their results have been published in Bulletin 149, "Vegetation and Reproduction with Special Reference to the Tomato." This is really an epoch making publication, a rare publication, indeed, because it reveals certain fundamental truths that will enable us to determine our general agricultural results. Perhaps the title is misleading so far as the average fruit grower and farmer of Oregon are concerned. Though the investigation does deal to a very large extent with tomatoes and is of great interest to scientists and vegetable gardeners it is of greater value to fruit growers and general farmers, because by its means they can interpret their general results and to a certain extent know why they are obtaining poor or good fruit or poor crops. The bulletin deals very largely with the relation to nitrates and moisture on the one hand, to carbohydrates (that is, substances like starch and sugar) on the other hand. Every response is apparently correlated with the relationship of these substances.

Such relationships are formed as follows:

1. Though there be present an abundance of moisture and mineral nutrients, including nitrates, yet without an available carbohydrate supply, vegetation is weakened and the plants are nonfruitful.

2. An abundance of moisture and mineral nutrients, especially nitrates, coupled with an available carbohydrate supply, makes for increased vegetation, barrenness and sterility.

3. A relative decrease of nitrates in proportion to the carbohydrates makes for an accumulation of the latter; and also for fruitfulness, fertility and lessened vegetation.

4. A further reduction of nitrates without inhibiting a possible increase of carbohydrates, makes for a suppression both of vegetation and fruitfulness.

This analysis is not intended, in any way, to convey the idea that only these compounds—carbohydrates, nitrates and moisture are concerned in vegetation and fruitfulness, but that the study in hand is principally concerned with them and the response resulting from an alternation of their relative proportions within the plant. It would be extremely difficult also to draw rigid lines between any particular class and the one next to it; since they intergrade insensibly one into another and yet, generally speaking, are recognizably distinct.

We have, coming up from the ground, the moisture and mineral nutrients, including the nitrates. On the other hand we have the leaves of the tree manufacturing from certain gases taken from the air and the materials which they secured from the roots, the carbohydrates on the other hand. With certain relationships we may get no vigor in the tree and no fruit. Other relationships produce both vigor of tree and fruit while in others we secure plenty of vigor, so to speak, but no fruit.

Let us see how these four statements pertain to the tomato plants.

Group 1, where we have an abundance of moisture and nitrates, but a small amount of carbohydrates, may be illustrated by plants which are well fertilized, but strongly defoliated, heavily shaded, or severely cut back or pruned. The growth of such plants is tender, weak or splindling and not productive of blossoms or fruit.

The second group where we still have an abundance of moisture and much nitrate fertilizer, suggest a great deal of vegetative growth. The amount of carbohydrate or sugar and starch present in the leaves, is utilized almost entirely for wood or vegetative growth and we get no tomatoes, so to speak. Such plants generally have thick, large green leaves and are characterized by being very vigorous, healthy or thrifty.

With the third group, we begin to reduce the amount of nitrate fertilizer placed on the tomatoes which permits of an increase of sugar and starch proportionately and immediately the plants begin to become fruitful, blossom heavily and set well.

In the fourth group of plants we cease using much nitrate, using little or none and the carbohydrates or sugars and starches accumulate in the plant and the proportion between them and nitrate is much in their favor. We find that while the plants may bloom under such conditions and have many blossoms, yet they fail to set and their vitality becomes weakened.

Fruit growers are interested to know just how the four statements mentioned relate to the production of fruit. Let us dwell on this phase of the work for a few moments and see just how it pertains to apple trees for example. The first group of trees where we have an abundance of moisture and mineral nutrients but a very low available carbohydrate supply can be illustrated by a very common ordinary instance. For example, when we entirely dehorn a tree leaving nothing but its trunk. By such a practice we have removed practically all of the sugar and starch from the tree, and we have a great abundance of moisture and nutrients coming up from the ground. The tree can not utilize, however, this material which we have because the tree has not enough starch on the one hand, neither has it the foliage to utilize food on the other. In this case the tree very frequently dies or makes an extremely feeble growth for a number of years.

Another good example would be where we practice severe summer pruning. That is, where we remove unusually large quantities of wood and leaves from the tree instead of practicing a rather light cutting. Invariably this heavy cutting will devitalize and reduce the carbohydrates and amount of foliage necessary to manufacture more food.

In the second group where we have an abundance of moisture and nitrates with a certain available carbohydrate supply we get greatly increased wood growth but rarely any fruit. For young trees, say trees from one to six years of age, especially if such trees are growing on rich, moist soil and have in addition been rather heavily pruned during the dormant season, the result is a great deal of vegetative growth. All the orchard practices with these young trees tends to encourage vegetative growth and to discourage the formation of fruit.

In the third group we have a common example with trees, say from nine to thirteen years of age. Here the trees have fair vigor and are producing heavy crops of fruit, because in these trees we have certain balance, so to speak, between the nitrates and the carbohydrates, that is sugars and starches. Neither one greatly predominates. Both correlate nicely and produce both wood growth and fruit.

We can illustrate the fourth condition with older apple trees, especially mature trees situated on light or worn out soil. Such trees often possess a very large number of spurs but make very little wood growth and appear greatly devitalized. Analysis might show that the wood in such trees is simply packed with starch yet there is not enough nitrate present in the trees to utilize it so it becomes of little value to it. Consequently, we do not get vegetative growth on the one hand, neither do we get fruit on the other hand. What few blossoms the tree does bring forth generally set very poorly and the drop of fruit is unusually heavy. It is with this class of tree that the application of nitrate works wonders because we restore the small amount of nitrogen which forms the balance between the nitrogen on the one hand and the carbohydrates on the other, and the tree again produces commercial crops.

Let us take up in detail the application of the fourth statement to our orchard problems. In order that we may more intelligently discuss this question I will divide the trees into three classes; first, the trees from one to six years of age. We will call this period the formative period. Second, trees from six to ten years of age. We will call this the transition period. Third, trees above ten years of age. We will call this the productive or mature period of our trees.

The first period or formative period is the body building period. This is the time when we are trying to get lots of vegetative growth in our trees. We are practicing very intensive tillage and early tillage so as to encourage the tree growth and to encourage the rush of sap containing nitrates and other minerals and moisture. As this material rushes up through the trees in the spring of the year they make their greatest terminal growth. After the leaves once begin to expand and assume normal size the vegetative growth, as far as terminal growth is concerned, begins to cease so that any process such as intensive tillage which will cause the trees to come to early activity will be conducive to this vegetative growth. If we intercrop trees of this age we should practice the intercropping with hoed crops such as strawberries, truck crops for the cannery such as beans, corn, tomatoes, etc., because the culture of such crops is the same type of culture which is desirable for our young tree. Our pruning during this period should consist largely of rather heavy cutting back in order that we may force out laterals where we desire them. We might say perhaps, that the pruning of trees of this age is valuable more for changing the type and direction of growth than anythting else. The result of all of these orchard practices is that we encourage the formation of nitrates on the one hand and discourage to a certain extent the formation of carbohydrates, that is the sugars and starches. As a result the first few years we are getting vegetative growth but not very much fruit. Yet this of course, should be our aim. We do not desire very much fruit from these young trees but do desire a good strong body for future crops.

By the time our trees are six years of age they should be sufficiently strong so that they can begin to bear commercial crops. We must now begin to change our practices because we must bring about a relationship between the nitrates and carbohydrates whereby the latter tends to increase in its proportion over the nitrates. To do this the orchard practices must be changed. For example we begin to let down on the tillage and do not practice quite as intensive tillage. If the trees are too vigorous, perhaps a little early spring tillage with no summer tillage or if the trees are greatly over stimulated, perhaps even a grain crop should be grown for a year. Our pruning begins to take the form more of thinning, opening the trees so that sufficient light may enter them to form buds and spurs, but discouraging heavy heading. The thinning out process will probably not disturb the carbohydrate formation as much as the heading. As a result our trees begin to increase in diameter, they begin to store more sugar and starch around the buds and begin to form more spurs and more fruit buds and consequently begin to bear. When trees from six to ten years of age are not bearing as they should it is generally due to being upset in some way. That is, too much heading in, too much tillage, too much irrigation, or the use of too large amounts of nitrogenous foods such as manures, cover crops, nitrate fertilizers, etc.

We now enter the third period, the productive period or mature period. Our orchards for a few years as a whole begin to do well. The crops are heavy, the type of fruit produced on such trees is very desirable, being large, well formed, and generally of very fair color. These are the orchards we are making our money out of. When the trees begin to get a little older, sometimes not older than fifteen years of age and other times it may be twenty-five years of age. No matter what this age may be, there gradually comes over the trees a certain decline. The leaves begin to grow smaller and thinner and take on a yellow tinge. The wood growth begins to cease, the trees are making very little new twig growth. The trees bloom but set very poorly indeed. Physiological troubles perhaps, begin to creep in such as little leaf, die back, fruit pit, rosette, winter kill, sour sap and other troubles too numerous to mention. If the summer happens to be a little hot and dry we see a great many troubles. For example, we found last year that our prune trees rolled their leaves badly and there was a heavy drop of prunes. Many of the prunes were malformed, having large watery areas, sometimes having gum pockets. A little later these areas often developed into dry tissue. These are all indications that something is wrong with our trees, that they are off in vigor, in vitality, that they need a change. We need to study our orcharding so as to prevent such tree declines if possible. It was with such trees as I have just mentioned that the application of nitrate of soda began to bring wonderful results. This nitrate of soda was applied a month before the trees bloomed, from three to seven pounds per tree. The blossoms were immediately influenced, being large and showy. The trees set much better and vegetative growth began to develop. The leaves increased in size and took on a handsome green color. The physiological troubles largely began to disappear. Generally the application of nitrate was followed by better tillage and the introduction in some cases of cover crops and where irrigation was possible the growing of alfalfa or clover among the trees. The trees were soon restored and the yield in some cases has increased over ten fold. What have we done? Why simply this. We added enough nitrates to the trees to restore once more the balance between the carbohydrates and the nitrates. An examination of these old trees would probably show the wood packed with sugar and starch but very little nitrogen. By adding nitrogen in some form we immediately restored the balance. Also a certain amount of pruning practiced on these trees regularly, equally distributed, cutting back some of the branches, thinning out here and there tends to renew the trees for the time being and encourage a proper proportion of carbohydrates and nitrates. It gives a little less wood for the time being to utilize the available nitrate supply, and consequently this tends to produce a balance in our trees. In other words, the application of this nitrate, the use of pruning, more tillage, and more cover and shade crops brought our trees back to the third condition, namely plenty of vegetative growth with an abundance of fruit. To keep this balance in our trees we must keep moisture in our soil during the growing season and we must study very carefully the question of organic matter and nitrates in the soil. Under non-irrigated conditions we must grow cover crops or add stable manure. The combination of such factors into the use of a small amount of nitrate may be found to be of great advantage. Under irrigated conditions the orchard should be sown to clover or alfalfa. Be sure to irrigate very thoroughly, even with shade crops. The orchards often need an application of nitrate in addition.

During the past few weeks many fruit growers have been writing to me concerning troubles which they have been having with their trees. In the first place the prunes did not set very well. Many prune trees looked bad this spring, produced no blossoms and few leaf buds. In fact there were large areas of trees that looked so bad the growers feared the trees might die. These trees are beginning to improve somewhat as the season advances. It is a question almost entirely of reduced vigor. Our fruit trees in general throughout the State last year sent out danger signs. That is they told us that they were not securing enough food and moisture. The many troubles that appeared all last summer indicated that that was the condition. Some of the troubles I have already enumerated. The early maturity of our apples, the prevalence of water core, the prevalence of early break down in our apples in the fall all were signs of a decreased vigor in our apple trees. Many of our pear trees are looking bad, some of them are dying, others have the tops dead, others have one or two branches on which the leaves have not developed normally, are small and poorly colored. Cherries are setting none too well. The last two days reports have come in that the apples are shedding very badly. While the bloom was heavy and the prospect unusually bright, the shed the past few days has been so unusually heavy that some men will have a very light crop. All of these indications simply are conditions which tell us that the trees are suffering in vigor. The extremely dry summers, two of them in succession, the heavy frost a year ago, poor drainage in some orchards, all such factors often contribute more to pollenization and tree troubles in the spring of the year than weather which we have in the spring or in the winter. Many people thought the light setting of prunes was due to a little cold weather and a few rains but we have checked up on this matter pretty closely and even in places where the prunes bloomed under very good conditions, and where bees were present, the set of fruit has been very light. On the other hand, orchards which are very vigorous but bloomed under trying weather conditions have good crops. The remedy is to take better care of our trees, conserve the moisture, see that nitrogen is abundant in our soil. More cover crops under nonirrigated conditions, more shade crops under irrigated conditions, should be our remedies.

Even trees six to ten years of age have shown many troubles during the past spring. Here again we get the results of drouth. That is, the vigor was too greatly suppressed by the two dry years. Many men practiced no tillage at all or intercropped too heavily with grain or allowed grass to grow in these orchards and the check went too far.

That is, a modern amount of check would have kept the trees in fair vigor and forced them into fruiting but carrying this just a little too far reduced the nitrate too low and our trees are not doing well. Trees can not be neglected at any one time and not pay the penalty. If we have the dry summers we must not be content by thinking, "well the trees do not look bad this fall, they have come through the two dry years in pretty good shape." We must wait until the next spring. That will really tell the story, because without a proper balance in the tree of the nitrates and carbohydrates, without a proper vigor which comes from such balance we can expect trouble and troubles have come to us galore this spring.

Too many of us are shiftless in our tillage methods. We practice our tillage altogether too late. A study for example of the prune sections of the State shows that those men who plow early, who till thoroughly, who occasionally grow cover crops, are having much less trouble with their trees than those men who do not practice these policies. Of course, we hear this sometime, that the very vigorous trees shed fruit badly, and are in bad shape. That is because an extremely vigorous tree will suffer during excessive drouth because the needs of a very vigorous tree are great. It has a large leaf area, it has many branches, the demands upon the soil are extensive, and if we cut off these demands this tree likewise may respond by poor setting the following spring or showing considerable die back in the tree.

One cause of low vigor in our prune trees, I am satisfied, is the practice of not pruning systematically and rationally. We prune spasmodically, very heavy for a year and then nothing for three or four years. This policy is a poor one. It allows too much weak, drooping wood to burden our trees and it is this type of wood this spring which is dead and in a very weak condition.

Pear trees need extremely careful watching. Unless we keep up the normal food and moisture supply many troubles appear. They are harder to grow than most other fruit trees which we are attempting to grow in Oregon at the present time.

Quite a few cherry trees this spring have dead branches and dead tops or are looking feeble. Investigations show, however, in the orchards where the soil is deep, where moisture has been conserved, there is very little such trouble. But where the cherries are planted on cold soils or soils which have little organic matter; soils for example, which may have been grained for forty to fifty years then planted to cherries; such orchards are the ones which are showing the trouble.

While the condition of some of our trees is perhaps discouraging it should, after all, give us hope and a certain amount of encouragment as it will teach us more and more how to handle our trees, how to study them, how to study conditions and if as a result of these last two dry years we have a period of better tillage, better pruning, better care of our trees, we will perhaps gain in the long run.

HISTORY AND DEVELOPMENT OF FRENCH WALNUTS IN OREGON

By Henry E. Dosch

> "The law of nature is that a certain quantity of work is necessary to produce a certain quantity of good of any kind whatever. If you want knowledge, you must toil for it, if food you must toil for it, and if pleasure you must toil for it."—Ruskin.

The history of the introduction of the English and French walnuts into Oregon would not be complete without tracing it to its origin on the Pacific Coast; I have spoken and written so much in the last thirty years on this important subject that I feel it is not pleasant to repeat oneself, but in a paper like this, which in a measure at least, is to be a guide to many persons who desire to plant nut trees and who have no experience, it is absolutely necessary to repeat the fundamental principles in nut culture, so they can start right, and also a message of encouragement to those who have followed my advice and planted a walnut grove.

The walnut is a native of Persia, and is supposed to have been introduced into Southern California by the Franciscan monks during the establishment of the California missions in 1769; records of its early history are scant, but mention is made of walnut trees growing about the missions by most writers of the "Record of the Founding of Missions," and the "History of Franciscan Missions in California," and therefore, it is safe to assume that with the advent of missions, dates the introduction of this valuable tree. I have seen some of these ancient walnut trees and while age began to tell on these gnarled giants and monuments of sentiment and homes left behind in sunny Spain, they still live and bear fine nuts.

These nuts were and are still known as the Los Angeles walnut, being rather soft shells and will only thrive in Ventura and neighboring counties in California. However, not many of this variety are now planted in California, but owing to the success Oregon had in growing the choice Franquettes and Mayettes and the higher prices paid for them in the eastern markets, have planted large groves to Franquettes and Mayettes.

This brings us to the

History and Development of the French Walnuts in Oregon

When, some thirty years ago, I retired from business to regain my health, I bought the out of town place adjoining the city limits of Portland five hundred feet above the sea level, on which we now live; the doctors' advice was to keep my mind engaged while my body would catch up; being a lover of all nature, trees, bush and flowers, my mind drifted to the cultivation of walnut trees. Knowing little or nothing of the habits and growth of the English walnut, except reminiscences of my boyhood days in Europe, I began to read up and to inquire of those whom I saw had large walnut trees growing, especially some on Sixth Street in Portland, and some in Milwaukie, planted by Luelling, an early nurseryman, and some other places, but was informed that Oregon was not a nut growing country as some of these trees were more than thirty years old and had never borne any nuts; I concluded that there must be some good reason for this, as I could not convince myself

100-ACRE WALNUT GROVE OF THOMAS PRINCE, DUNDEE. LARGEST COMMERCIAL GROVE IN OREGON that a country which grew every kind of fruit to such perfection as Oregon, having all the advantages in soil and climate that France and Germany have, where the English walnut flourishes abundantly; could not grow that royal fruit, and soon learned that the variety planted here was the Los Angeles, described above, the most delicate walnut grown; after studying these trees, the following spring I found that the staminate or male blossom came abundantly some six weeks earlier, matured and dropped off, before the pistillate or female blossom came in bloom, which after attaining the size of a pea dropped off for lack of pollenization; I also found that some of the earlier German settlers had sent to their old homes for some nuts to plant, which thrived fairly well, and had borne some nuts, which proved to be the old English walnut, very hard shell, and some even oily and rancid taste.

Feeling that there must be other varieties which were adaptable to Oregon, both as to softness of shell and palatableness of kernel, I wrote to Mr. Felix Gillette of Nevada City, Calif., who made importation and growing of walnut trees a specialty. He sent me five-year-old trees of second generation, Proepartarines and Serotina varieties, which were duly planted with utmost care and every attention given afterwards but did not seem to do well, principal cause, unsuitable soil, for my ground is heavy clay underlaid with six feet of hardpan, resting on iron granite foundation, absolutely unfitted for walnut culture, nevertheless, I planted more trees of Franquette, Mayette, Cluster, Fertile and others, which did fairly well, though very slow growth, but being bisexual and blooming late are and have been bearing very choice fruit. I also planted some hundreds of nuts and sent the yearling trees all over Oregon, Washington, Idaho and even Montana to acquaintances to plant and have received most encouraging reports, some trees growing to thirty feet in height and bearing very fine nuts. It was simply a labor of love on my part, as I did it only for my own pleasure and for my fellow horticulturists and not as a business proposition, as I never had trees or nuts or land for sale, but I saw before my mind's vision the words of Carlyle when he said, "You can help your fellowman; you must help your fellowman; it is a duty, nay, even a divine privilege to lighten the burden of our fellow laborers by giving them the results of our best thoughts and experiences."

The first man who followed my advice and to whom honor is due, for his close application to nut culture in all its varieties ever since, is Mr. A. A. Quarnberg of Vancouver, Wash., followed closely by Mr. Prince of Dundee, Ore., and Mr. Charles Ladd of Carlton, Ore., followed of course, by those large plantations about McMinnville, now under control and advice of Mr. Cooper, president of the Western Walnut Association, as well as Mr. Charles Trunk and Mr. Forbes of Dilly; one thousand acres in Marion County, over one thousand acres in Polk County and many other plantations throughout the State.

As I stated before it is now over thirty years since I first experimented in nut culture, and it is not necessary to state here the many obstacles that had to be overcome and the many disappointments I met with, though practically all walnut trees planted since in Oregon, Washington, British Columbia and even Montana, Wyoming, Idaho and Utah, many of which are now in full bearing, were planted at my earnest solicitation and those which were planted on proper soil and varieties adapted to our climate have proven revenue producers. This development, though slow, and the marketing of our superior product has been so pronounced that in the last few years I have again received many letters of inquiry by intending immigrants from many eastern, middle western and even southern states about walnut culture in Oregon, which of course, were given careful attention and reply; and also letters from many others all over the Pacific Northwest writing what success they had with their walnuts and thanking me for the advice I had given them.

It should not be necessary and yet I deem it advisable to repeat, that nut trees of all kinds do well on most soils, except heavy, stiff, clay soils; it does best in moist, warm, sandy, rich loam, well underdrained with no hardpan, stiff clay or impenetrable soil nearer than twelve feet, as they are gross feeders.

After giving a thorough test to all known European varieties, the rest of which I imported from France, as well as grafted trees of various varieties from California I have reached the conclusion that for the Pacific Northwest the Franquette, Mayette, Chaberte, Parisienne and Columbia are best adapted to our soils, climate and market, giving preference in the order named; I consider the Franquette somewhat hardier, a regular bloomer and more prolific, while the Mayette or Grenoble under which name this nut is known to the trade, is finer, though not so hardy and the Chaberte and Parisienne are sought after by confectioners; we also have now some promising seedlings, like the Columbia, which may prove a happy addition.

For a number of years and even the present time there has been a considerable controversy about trees grown from the nuts or seedling trees, bearing smaller nuts and not so prolific as grafted trees. In order to satisfy my own mind again last year I examined some large groves of both seedling and grafted trees in bearing. Mr. Forbes at Dilly said that his grafted trees bear three times as many nuts as his seedlings, but recently he told me that this year his seedling trees bore full crops, while in Mr. Trunk's grove (fifty acres), I find his seedling trees show more than double the nuts his grafted trees of the same age and variety, and on Mr. Prince's grove (one hundred acres) both seedlings and grafted trees bear alike both as to quantity and size of nuts; and this year carry all the nuts they can possibly hold, some of which will yield one hundred pounds.

On my own ground both seedlings and grafted trees bear lightly on account of the heavy clay soil and impenetrable hardpan. That practically leaves the question still open for further investigation though personally I lean to the belief, that if the nuts to be planted for seedling trees are taken and selected from bearing, acclimated, grafted trees and planted in several varieties for cross pollenization, good results will be obtained.

Our northwestern grown walnuts command a higher figure in the eastern markets than the California product. Some years ago the output of Mr. Prince's walnut grove was sold to a wholesale grocer in New York, who makes a specialty of supplying those retail grocers who handle only the finest and costliest brands. This merchant states that the walnuts from California do not come up to the requirements of his trade but the Oregon nuts do, as they are of the same varieties and similar in quality to the nuts he imports from France for his trade, in fact they are better flavored and more nutty than the California product.

The importation of nuts into the United States has steadily increased from year to year. The government year book recently received gives the following report of importation for the year:

"Shelled walnuts, 11,107,490 pounds, valued at $2,322,754; unshelled walnuts, 22,338,348 pounds, valued at $1,661,473. Total 33,445,838 pounds, valued at $3,984,227."

This shows an increase from the year 1903 of 12,362,567 pounds to 33,445,838 pounds for 1915, notwithstanding, the disturbed condition of Europe. This is an enormous increase, both in importation and consumption. It might be casually observed also, that of late years, many walnuts have been imported from China and passed off by dishonest dealers on an unsuspecting public as Pacific Coast grown walnuts, many of which, both European and Chinese, have found their way into the Pacific Northwest.

Judging from reports which have come to me from all over the Northwest of the many plantations coming into bearing and the success growers have met with, it is most gratifying to me to learn, though the development was slow and tedious, we in Oregon have now reached the point of exporters instead of importers which will increase steadily as the hundreds of newer plantations come into bearing and that my efforts and experiments in introducing the French walnuts into the Pacific Northwest have not been in vain.

Kindly permit me to quote from a paper I wrote and read at our Horticultural Society meeting some fifteen years ago:

"We of the Pacific Northwest should become exporters instead of importers; we have the soil and climate, hence my earnest advice still is, as it has been for many years to plant a few walnut trees, if you do not want a grove, and your children's children will bless you and thank you for your forethought.

"As a business proposition I know of no better in agriculture or horticultural pursuits, and once established a well cared for walnut grove is the best heritage a parent can leave to his family, as they become more valuable and more productive with age, always bearing in mind soil and variety."

The progress and development of walnut culture has proven that this assertion is even more true today, than when it was written fifteen years ago.

As long ago as 1893, I read a paper before the Horticultural Society in which I said: "The French walnut is to the orchard what the rose it to the flower garden, and wherever you see a walnut tree in a dooryard you may rest assured that warm hearts dwell within and you are equally assured a hearty welcome in a hospitable home."

Reviewing the whole situation as it presents itself today, we can not help reaching the conclusion that walnut culture in the Pacific Northwest has not only reached a high plane of development, but is an assured success.

In closing permit me to express the hope that at no distant day every dooryard will have its walnut tree and walnut groves will be measured by miles along the public highways.

Addenda

French Walnut Trees for a commercial grove should be planted not less than fifty feet apart; for fillers use prunes, loganberries and grapes for juice. Cut out when walnut trees need all the ground.

French Walnut Trees begin to bear at six years and in full bearing at twelve years, increasing as they grow older.

French Walnut Trees live to over one hundred years, bearing nuts.

French Walnut Trees planted from seed as yearlings should have all branches removed every fall, allowing the center stem to grow to seven feet and then allowed to branch out.

French Walnuts should be gathered as soon as they fall, washed and dried in an evaporator under eighty to one hundred degrees Fahrenheit to prevent moulding.

French Walnut Culls should be pressed into oil for culinary purposes; residue or pulp fed to cows.

French Walnuts should never be bleached, it destroys their flavor, but should be washed before drying.

Varieties

Franquette. Blooms late in spring. Originated about the same time as the Mayette in the southeast of France by a man named Franquet. It is quite large, of an elongated oval and very attractive, the kernel late in spring, very desirable for a market nut.

Mayette. This is one of the finest dessert and market nuts grown. It is quite large, and uniformly so; well shaped with a light colored shell; the kernel is full fleshed, sweet and nutty. But what renders this valuable kind more valuable yet, is that it is very hardy, being late in budding out, which enables it to escape uninjured the disastrous effects of late frosts in the spring; it is also an abundant bearer.

This is the nut imported into the United States under the name of Grenoble. The Mayette was originated by a man of the name of Mayet, one hundred and fifty years ago, having ever since been a great favorite as a market nut.

Parisienne. Large, excellent, starts late in the spring. This beautiful nut, also one of the finest for dessert and market, was originated in the southeast of France, and not in the neighborhood of Paris, as its name would imply. Its beauty made it Parisienne in honor of the capitol of France; the nut is large, broader at the small end than the Mayette and Franquette, and has a very pretty shape. It is as late and hearty as the Mayette.

Chaberte. An old and most valuable variety, late in budding out. The nut is well shaped, roundish-oval and of fair size, the kernel is of extra fine quality; good bearer. The Chaberte originated in France over a century ago, by a man named Chaberte, hence its name.

Meylan. A new and very attractive variety, originated near the little village of Meylan, in the walnut district of France. The nut is of fair size; very smooth, thin shelled and of excellent quality, buds out late.

Columbia. Originated by Mr. Felix Gillet of Nevada City, Calif.; produced from a second generation Mayette. The nut is very large, exceedingly pretty, roundish with smooth light colored shell and kernel of first quality; named Columbia in honor of the World's Fair in 1893, the year Mr. Gillet's second trees of that kind went into bearing.

Alpine or Wonder of the Alps. A new and very rare variety, originated not very long ago in the Alps Mountains in France. Next to the Mammouth it is the largest walnut grown. Though the shell looks rough, it is perfectly soft and thin, the meat sweet and filling well the shell.

The Gladys, Mammouth, Gant and Bijou all giant walnuts, some three times as large as the ordinary walnuts, good producers and nutty, not desirable for market, except as a novelty or grown to be pressed into salad oil.

Walnuts intended for seedling trees, should be carefully selected as soon as they fall from the trees, then placed into shallow boxes to wit: Cover the bottom of the boxes with three inches of sand, set in the walnuts pointed end up, half inch apart, cover with four inches of sand and place the boxes in the basement, keeping the sand damp, not wet, and cover with wire netting to prevent rats or squirrels from stealing them. About March or April you will find all fertile nuts are sprouting; take up carefully and plant into nursery rows or better still, where the trees are intended to grow.

The appelative "English Walnuts" is only a commercial term and are not grown any more as they are hard shelled and have a tendency to become oily and rancid. All those grown now are French walnuts or seedlings of French walnuts, semisoft shells, meaty and toothsome.

For success remember, variety, rich soil, clean cultivation and "no hardpan."

As a further encouragement to growers and intending planters I beg to state, that the following additional phenomenal bearing walnut trees have been reported since writing the above:

Mr. Sol. Lindley near Lebanon has seven bearing walnut trees on his farm and says he sold the nuts from them last fall for between $30.00 and $40.00 a tree.

Two walnut trees twenty-five years old on Gravely Hill near Portland produced six bushels each.

One Franquette walnut tree near Albany, sixteen years old, produced nuts which sold for $30.00.

Another Franquette tree at Brownsville twenty years old produced nearly eight bushels of fine nuts which sold for $40.00.

A seedling walnut tree at Salem produced four bushels of nuts.

An eight year old Mayette walnut tree in Yamhill County produced $15.00 worth of fine nuts, and many others I might quote, but these are samples of what walnut trees will do in Oregon on good and proper soil and variety.

Food Value of Walnuts

Of course, we have always eaten nuts, but only a few at a time, in after dinner dilettante sort of fashion, and never until recently have we regarded them as real food with a nutriment value almost equal to beefsteak.

War necessity, however, put American housewives wise to walnuts and they have quickly learned to employ them in dozens of ways in the preparation of our daily meals. Walnut bread is now made in hundreds of thousands of homes, while walnut muffins, walnut cakes, walnut and raisin coffee bread, walnut cookies, walnut wafers and walnut puddings are being used almost universally. Walnut and grape conserve, and walnut chocolate pie have become quite popular, while walnut fruit salads and walnut salmon salads and walnut ice creams, have come to be almost as generally used on the American dinner table as bacon was before it soared to dizzy heights.

Food Value Made Clear

After all, there is a good reason for this as the superiority of walnuts as a meat substitute as well as a substantial and perfectly balanced article of food is shown by the following table recently issued by the Department of Agriculture, which gives the comparative food values for four leading articles of diet, namely: Walnuts, beefsteak, Irish potatoes and wheat flour:

	Water	Protein	Fat	Carbo-hydrates
Walnuts	2.8	16.7	64.4	14.8
Irish potatoes	78.3	2.2	.1	18.4
Beefsteak	61.9	18.9	18.5	00.0
Wheat flour	12.8	10.8	1.1	74.8

Western Walnut Association,
McMinnville, March 23, 1919.

Col. H. E. Dosch, Portland, Oregon.
My Dear Comrade:

You were one of my first inspirations to take up the study of the English walnuts in Oregon, when I had the Prince exhibit at the Lewis and Clark Exposition in 1905, although a walnut lover from childhood.

When I made investigation of the habits of the English walnut and learned of its adaptability to our soil and climate I became convinced that its success as an investment here would be sure, and my faith and enthusiasm have not diminished one particle.

In 1913, together with some other walnut enthusiasts, we secured the establishment of a walnut experiment station here, through the energy of Hon. Walter Graves, then a member of the Legislature from this county. We ran the experiment work for four years, although the appropriation was for only two years. The interest created abroad in walnut industry in this section was attributed to the station work, although a great majority of the planting had been done prior to this date at your advice and experiment, and much of the propaganda could be attributed to the advertising department of the Southern Pacific Railroad people; Wm. McMurray, who had faith in the walnut industry, and A. C. Jackson, who prepared an attractive booklet that ran through two large editions, and of which I was listed as the editor. The experiment station got out a bulletin in 1914, that ran through two editions, one copy being furnished to each public school in the state.

Beginning about ten years ago the walnut industry had a boosting stage in which many improper methods were employed in the sale of cheap trees, unsuited lands, methods of planting, etc., and which was the cause of many disappointments, and the industry languished for a time. Then the precocious varieties began to bear a few nuts, and growers paid more attention to the walnut.

The crop of the last year was a record and fifty per cent over, and may be expected to greatly increase each year. This is my fifth year as president of the association and the reports of production for the last year were certainly gratifying: Prof. C. I. Lewis reported 240 trees, nine years old on hill land, new, 6,000 pounds. Ferd Groner, one block nine, ten and eleven years old grafted on seedlings the seed of which were planted twelve years ago, average twenty-one pounds per tree, some trees as much as forty pounds, another eleven pounds per tree, another hill orchard four pounds per tree on six year old grafted on field planted seed. Prof. F. G. Young, silt soil, 400 Vrooman Franquette grafted trees eight years old 4,500 pounds, 225 seedlings eleven years old 800 to 900 pounds. (He displaced about twenty-five per cent of his seed trees because they were late bloomers.) G. A. Dearborn, Dundee, red hill land 300 seedling trees twenty-two years averaged twenty-two pounds, 600 nine to eleven years, seventeen and one-half pounds per tree. Clyde Lafollette, 120 ten year olds, 2,850 pounds, over $1,000.00 worth of walnuts and $3,000.00 worth of peaches from seven acres rich bottom land. Ferd Groner one large top grafted black, nine years ago, 428 pounds. A. A. Quarnberg, seven year old, seventeen pounds and eighteen year old, seventy pounds. E. C. Apperson, $124.00 worth from five trees, 215 pounds from one nineteen year old. Charles Trunk, seventy-seven trees twelve years old, fifty trees eleven years, ninety-four trees ten years, 221 trees eight years, twenty pounds per tree, $6.20 per tree, $111.60 per acre or eleven per cent on $1,000.00 invested.

George Dorris on filberts reported five year old tree sixteen pounds, six and seven year old twenty-one pounds, ten year old tree forty-six pounds, thirteen year old tree fifty to sixty pounds Barcelonas. H. A. Kruse one and two-third acres 2,165 pounds, fifty Barcelonas thirteen years old bore 1,500 pounds in 1918.

There is probably 3,000 acres of walnut trees that are bearing and coming into bearing the present year in Yamhill County.

Very truly yours,

J. C. COOPER.

STANDARD PACKING AND GRADING RULES OF THE APPLE GROWERS' ASSOCIATION, HOOD RIVER, OREGON

Blue Diamond Grade (Growers Stamp "Extra Fancy" on Center of Box End)

This grade is defined as smooth, mature, clean, handpicked, well formed apples only. Free from all insect pests, diseases, blemishes, bruises and other physical injuries, scald, fungus, scale, dry or bitter rot, worms, worm stings, worm holes, spray burn, limb rub, visible water core, skin puncture or skin broken at the stem.

The following varieties shall be admitted to this grade, subject to the color requirements specified:

Arkansas Blacks, Spitzenbergs, Winesaps. Must have not less than three-fourths good red color.

Jonathans and Delicious. Must have not less than two-thirds good red color.

Oregon Reds. Must have three-fourths good red color and the characteristic russeting of this variety must not extend to the cheek.

Hyde's King, Red Cheek Pippin, Winter Banana. Must have a perceptible blush cheek.

Ortley. Must be white, yellow or waxen.

Yellow Newtowns. Must have the characteristic color of the variety.

All fruit packed under this grade must be wrapped in the printed Blue Diamond paper. All boxes to be lined and layer boards to be used tops and bottoms.

By color is meant the characteristic color of the variety. A brown, faded or dead color will not be accepted.

Red Diamond Grade (Growers Stamp "Fancy" on Center Box End)

This grade is defined as apples complying with the standard of the first grade apples, except that slight leaf rubs, scratches or russeting shall be permitted up to a total of one inch in diameter in counts running 125 or less to the box or three-fourths of an inch in diameter in counts running 138 to 163 to the box, and one-half inch in diameter in counts running 175 or more to the box in all cases where the color requirements are equal to the color rules provided for this grade. Limb rubs will be permitted showing an aggregate area in the various counts of one-half the diameter of that allowed for leaf rubs.

No apple packed under this grade shall show total blemishes aggregating more than one inch in diameter in counts running 125 to the box or less, or more than three-fourths of an inch in diameter in counts running 138 to 163 to the box and one-half of an inch in diameter in counts running 175 or more to the box.

Provided that all red and striped varieties having the color requirements of Extra Fancy shall be allowed to carry not to exceed one healed over sting, and all yellow or blush varieties having all requirements for Extra Fancy, be allowed to carry not to exceed one healed over sting.

Provided always that all apples must have one clean cheek equal to one-half of the area of the apple.

No clearly misshapen or bruised apples shall be permitted in this grade.

The following varieties shall be admitted to this grade subject to the color requirements as specified:

Arkansas Blacks, Spitzenbergs and Winesaps must have not less than forty per cent good red color.

Jonathans and Delicious must have not less than one-third good red color.

Red cheek or blushed varieties must have correct physical qualities with tinge of color.

Yellow or green varieties must be of characteristic color.

All fruit packed under this grade must be wrapped in the printed Red Diamond paper. All boxes must be lined and layer board be used top and bottom.

Combination Blue and Red Diamond Grades (Growers to Stamp "Fancy" on the Center of Box End)

This grade is provided as a commercial outlet for all varieties of apples not included in the varieties as specified under grading rules for Blue and Red Diamond grades. Physical defects are limited to the defects specified under Red Diamond Brand.

Aiken Red, Baldwin (except Oregon Reds), Gano, King David must have at least forty per cent good red color.

Ben Davis, Hubbardson, Jeniton, Missouri Pippin, Black Twig, Northern Spy, Snow, Stayman Winesap, Wagener, Wealthy, York Imperial must have not less than one-fourth good red color.

Green or Yellow varieties, such as White Winter Pearmain, Cox Orange, Grimes and Swaars, must be of characteristic color.

Red Cheek or Blush varieties, such as Maiden Blush, must have correct physical quality with tinge of color.

Rome Beauties must have a perceptible blush or overcast of reddish color characteristics of this variety.

All apples packed under this grade must be wrapped in printed Red Diamond paper. All boxes must be lined and layer board be used top and bottom.

Defiance or Mountain Grade (Growers to Stamp "C" Grade on Center of Box End)

This grade shall consist of mature, handpicked apples, free from all insect pests, worms, worm holes, infectious diseases, skin puncture, bruises or broken skin, but slightly misshapen apples or those having slight sun scald and not to exceed two healed over stings and the blemishes allowed for Red Diamond grade shall be permitted.

All apples of striped or red varieties must have a tinge of color. All apples 175 and smaller in red varieties must carry 25 per cent color, and in striped varieties must carry 10 per cent color; all apples must have one clean cheek. All fruit packed under this grade must be wrapped in plain paper and all boxes must be lined and layer board to be used top and bottom.

Sizes

We are appending a list of sizes permitted under northwest grading rules:

Apples smaller than allowed in standard grades but otherwise conforming to the requirements thereof, may be packed and stamped under these grades if desired by the grower. Such apples will be sold as market conditions warrant. It would be wise to consult your sales office before packing smaller sizes than suggested in these rules.

Wiping Apples

Better results can be secured if we can offer the trade bright, attractive apples, removing all signs of spray, dust or aphis. All apples must be clean when packed and apples must be wiped when necessary. This rule is imperative where growers have used Bordeaux as a late spray or where aphis is serious.

Marking Boxes

Regularity is most desired and we urge care in proper marking. On one end of the box at the upper left hand edge mark the size (number of apples) and on the upper right hand edge mark the grower's number. On the upper center mark the variety. On the center of this end so the words can be covered with our label, mark the grade. On the other end of the box at the upper left hand edge, mark the grower's name and address and on the upper right hand edge mark the packer's number, (see cuts). In the use of stamps for marking boxes you must provide yourself with the regulation black ink pads so as to create a uniformity of packages.

Be careful, please, in marking boxes as to correct size. Some of our members are using the hundred pack and mismarking the boxes. See that all sizes are shown correctly; if you pack 100 count, mark boxes 100 (see cuts).

Explanation

It is the purpose of these grading rules to cover the physical defects so far as it lies in our power in making our apples commercial in all respects.

There can be but one definition for Blue Diamond and we must maintain that standard.

In our Red Diamond grade it is the purpose of these rules to have apples that meet the color requirements of this grade to carry only the physical defects permitted in this grade, believing that the lack of color is in itself a defect.

We are attaching herewith a table of sizes admitted to these grades with the understanding that the commercial apple now provided for American use covers the sizes as noted, but it is absolutely necessary in packing the smaller apples to have them as attractive as possible in their sizes.

Paper

As a commercial proposition, as well as a matter of economy, your association has provided the different sizes of paper for the different sizes of fruit. You will therefore, arrange to order and use the following sized paper for the sizes of fruit as noted:

80 and larger to the box, 12x12.
88 to 125 to the box, 10x10.
138 to 163 to the box, 9x9.
175 and smaller to the box, 8x8.

As we are advertising very extensively it is very important that you pack all the Blue Diamond grade under the Blue Diamond wraps; the Red Diamond grade under the Red Diamond wraps and the Combination grade, being the Blue and Red combined, is shipped out under our Red Diamond label and must be wrapped in Red Diamond paper. The misuse of this printed paper would work to the detriment of your association.

Variety	Min. Size Extra Fancy	Min. Size Fancy and Combination	Min. Size C Grade
Aiken Red	......	200	200
Arkansas Black	225	200	200
Baldwin	......	200	200
Ben Davis	......	200	200
Cox's Orange Pippin	......	200	200
Delicious	163	163	200
Gano	......	200	200
Grimes Golden	......	200	200
Gravenstein	......	175	200
Hubbardson Nonesuch	......	163	200
Hyde's King	200	200	200
Jeniton	......	225	200
Jonathan	225	225	200
Jeffries	......	225	200
Kaighn Spitzenberg	......	200	200
King Tomkins Co.	......	163	200
King David	......	225	200
Maiden Blush	......	163	200
McIntosh Red	......	225	200
Missouri Pippin	......	200	200
Mammoth Black Twig	......	200	200
Northern Spy	......	200	200
Oregon Red	225	......	......
Ortley (Cleopatra)	225	225	200
Rainier	......	200	200
Rome Beauty	......	......	200
Red Cheek Pippin	200	200	200
Spitzenberg	225	225	200
Stayman	......	200	200
Snow	......	225	200
Vanderpool	......	200	200
Winesap	225	225	200
Wagner	......	200	200
Winter Banana	163	163	200
White Pearmain	......	225	200
Wealthy	......	200	200
Yellow Newtown	225	225	200
York Imperial	......	200	200

Standard Marking for Boxes

150 **Spitzenberg** **Grower 231**

EXTRA FANCY

John Doe,
Hood River,
Oregon

Packer
Number
120

Yours very truly,
APPLE GROWERS ASSOCIATION,
A. W. Stone, General Manager
C. W. McCullagh, Sales Manager

September 20, 1917.

Standard Pear Packs

Tier	Style	Row	No. in Box
5	4-3	6-6	210
5	4-3	6-5	193
5	3-3	6-6	180
5	3-3	6-5	165
5	3-3	5-5	150
5	3-3	5-4	135
5	3-3	4-4	120
4	3-2	6-5	110
4	3-2	5-5	100
4	3-2	5-4	90
4	3-2	4-4	80
4	3-2	4-3	70
4	3-2	3-3	60

The diagonal pack is used for all pears.

Pears are generally packed directly from the picking box and the rules for packing are about the same as in the case of apples. They are generally packed with a much greater bulge, however, than is customary with apples, since the shrinkage of the pear is greater than that of the apple.

GRADING AND PACKING RULES OF ROGUE RIVER VALLEY

1.

Every box of apples and pears shall have clearly stamped upon it the number of fruit contained in the box, and packer's numbers. This shall be done by the packer.

2—BARLETT PEARS

Blue Triangle Grade

Smooth, full matured fruit, practically free from blemishes and bruising and free from physical defects and of a size not smaller than 165 pears to the box shall form this grade. All stemless pears, second bloom and deformities of all kinds shall be eliminated. All pears shall be wrapped and packed tight with neatness and uniformity and each box shall weigh not less than fifty-one pounds gross. This grade shall be packed only in printed wraps.

Red Triangle Grade

This grade shall consist of all fruit which does not meet with the requirements of the first or Blue Triangle grade as to blemishes and deformities, but which in every way is sound and marketable and shows no diseases, skin puncture or defects that would injure the keeping qualities. Clearly misshapen fruit shall not be admitted to this grade.

All pears in this grade shall be packed in the same manner as full boxes of the first grade or Blue Triangle, using plain wraps. No pears smaller than 200 to the box shall be admitted to this grade.

3—COMICE, BOSC, ANJOU, HOWELL

Half Boxes—Blue Triangle Grade

This grade shall consist of such fruit only as will pack not more than 55 per half box. It must be practically free from blemishes and bruising and free from physical defects and true to natural characteristics of its respective variety. It must be packed tight in the box with a bulge of approximately one inch over all. It must be packed with lace paper, corrugated layer board on the bottom, lithographed mat on top, with corrugated layer board in addition next to the wood top; also lace paper must be folded three inches from the outside. Printed wraps must be used.

Half Boxes Red Triangle Grade

This grade shall consist of all fruit that will pack not more than 55 per half box and which does not meet the requirements of the first or Blue Triangle half-pear grade as to blemishes and deformities, but it is in every way sound and marketable and shows no diseases, skin puncture or defects that would injure the keeping qualities. Clearly misshapen fruit shall not be admitted to this grade. All pears in this grade shall be packed tight in the box with a bulge of approximately one inch over all. They must be packed with standard lining paper and corrugated paper board top and bottom. Plain wraps must be used.

Full Boxes, Blue Triangle Grade

This grade shall consist of all fruit not packed in half boxes and which is free from blemishes that will detract from its appearance and keeping qualities, and free from all diseases, stem out or bruising, and not smaller than 165 pears per box. The fruit packed under this grade shall be true to the natural characteristics of the variety. All pears shall be wrapped and packed with neatness and uniformity and each box shall weigh not less than fifty-one pounds gross. Printed wraps shall be used in packing this grade. It is understood that this grade is similar in quality to the half box Blue Triangle grade, except as to size of fruit.

Full Boxes Red Triangle Grade

This grade shall consist of all fruit not packed in half boxes, which does not meet the requirements of the first or Blue Triangle full box grade as to blemishes or deformities, but which is in every way sound and marketable and shows no diseases, skin puncture or defects that will injure the keeping qualities. Clearly misshapen fruit shall not be admitted to this grade. All pears in this grade shall be packed in the same manner as full boxes of the first or Blue Triangle Grade, using plain wraps. No pears smaller than 200 to the box shall be admitted to this grade.

4—WINTER NELIS PEARS

Half Box Blue Triangle

This grade shall consist of all fruit that will pack not more than 100 pears to the box, which is free from blemishes that will detract from its appearance and keeping qualities. It must also be free from all diseases and stem out and practically free from bruising and true to natural characteristics of the variety. It shall be packed tight in the box with a bulge of approximately one inch over all. It shall be packed in printed wraps.

Full Boxes Blue Triangle Grade

This grade shall consist of all fruit that is not packed in half boxes, and that is free from blemishes that will detract from its appearance and keeping qualities; it must be free from all diseases and stem out and practically free from bruising, and true to natural characteristics of the variety. It shall be packed with neatness and uniformity. Each full box shall weigh not less than fifty-one pounds gross, and the pears in each box shall be of a uniform size unless otherwise ordered. The pears shall be packed in printed wraps. It is understood that this grade is similar in quality to the half box grade, except as to size of fruit.

5—APPLES

Blue Triangle Grade

This grade shall consist of sound, smooth, well formed apples only; free from all insect pests, disease, blemishes and physical injuries; free from worms, worm holes, stings, scale, scab, sun scald, dry rot, decay, fungus, watercore, spray burns, limb rub, skin puncture, skin broken at stem.

All apples must be of natural color, shape and condition characteristic of the variety. Apples heavily coated with dirt must be cleaned.

The following varieties only shall be admitted to this grade: Arkansas Blacks, Delicious, Grimes Golden, Jonathan, Gravenstein, McIntosh Red, Ortley, Red Cheek, Rome Beauty, Spitzenberg, Stayman, White Winter Pearmain, Winesap, Yellow Newtown, Winter Banana.

Color requirements for this grade are as follows: Solid Red Varieties: Arkansas Black, McIntosh Red, Spitzenberg, Jonathan and Winesap must have at least 75 per cent of good natural color. Striped or partially red varieties: Delicious, Rome Beauty, Gravenstein and Stayman must have at least 50 per cent of good natural color. Red cheeked or blushed varieties: Red Cheek Pippin and Winter Banana must have a distinctly colored cheek or blush. Ortly must show white, yellow or waxen.

Sizes in this grade shall not be smaller than 150 count, except Winesap, Jonathan and Yellow Newtown, which may run as small as 163 count. Delicious, Rome Beauty, Stayman and Winter Banana shall not be smaller than 138 count.

Red Triangle Grade

Apples in this grade shall possess the same physical requirements to soundness and freedom from insect pests, disease, blemishes and physical injuries or defects as provided for in the Blue Triangle grade. Apples showing slight limb rub and russetting shall be admitted to this grade, provided that no apple shall show such blemishes of more than one-half inch square area. Slight deviation from proper form may be included, but this will not include clearly misshapen fruit. Apples heavily coated with dirt must be cleaned.

All varieties of apples shall be admitted to this grade.

Color requirements for this grade are as follows: Arkansas Black, McIntosh Red, Jonathan, Spitzenberg and Winesap must have at least 40 per cent of good natural color. All other red or partially red varieties must have at least one-fifth of good natural color, except that Rome Beauty, size 125 and larger showing not less than 10 per cent color may be admitted to this grade.

Red cheeked or blushed varieties must have correct physical qualities, without requirement as to color.

Sizes in this grade shall not be smaller than 175 count, except Jonathans, Spitzenbergs and Winesaps may be admitted in sizes 188 to 200 with color requirements 75 per cent color. Yellow Newtowns may be accepted to 200 size, inclusive.

System of Size Designation

The system of designating contents of boxes, and manifesting by tiers is to be abandoned, and the numerical system employed exclusively hereafter. The only recognized counts for northwest standard apple packs are as follows: 41, 45, 48, 56, 64, 72, 80, 88, 96, 100, 104, 113, 125, 138, 150, 163, 175, 188 and 200.

Packing

All apples shall be packed tight, with not to exceed approximately a one inch bulge over all. Corrugated layer board shall be used top and bottom in packing Spitzenberg and Newtown apples.

"C" Grade

This grade, when used, shall be made up of all merchantable apples not included in the Blue and Red Triangle grades. Apples must be free from all insect pests, diseases, physical injury, including bruises and broken skin. Apples must not be smaller than 200 size. There shall be no color requirements, except that apples must be matured. Apples in this grade shall not be wrapped unless specially ordered.

Special Grade Newtowns

Apples in this grade are equal to the Red Triangle grade, except that they may have one fungus spot which must not be larger than one-quarter inch in diameter or smaller spots aggregating a total area of not to exceed one-half inch square.

NURSERIES IN OREGON

Albany Nursery Company	Albany
Baker Floral and Seed Company	Baker
Benedict Nursery Company	Portland
Butzer, J. J.	Portland
Brooks Nursery Company	Lafayette
Bester, Carl	Portland
Brixey, C. T.	McMinnville
Broetje, Julius	Milwaukie
Carlton Nursery Company	Carlton
Capital City Nursery Company	Salem
Clarke Brothers, Florists	Portland
Collins, C. M.	Portland
Cummings, Harry	Heppner
Central Oregon Nursery Company	Prineville
Cooper, Geo. S.	Salem
Donald Nursery Company	Donald
Danzer Floral Company	Forest Grove
Drew, E. P.	Yoncalla
Eden Valley Nursery	Medford
Fruitland Nursery	Salem
Forshaw, S. H.	Pendleton
Groner & McClure	Hillsboro
Galligan, H. S.	Hood River
Gibson, W. R.	Hood River
Gill Brothers	Portland
Good, H.	Silverton
Holaday, A.	Scappoose
Hobbs, C. D.	Milton
Hood View Nurseries	Dufur
Hooker, L. W., & Co.	La Grande
Hicks & Riches	Woodburn
Ideal Fruit and Nursery Company	Hood River
Lafayette Nursery Company	Lafayette
Lewis, D. M., & Co.	Portland
McDonald, M.	Orenco
Mitchell, B. A.	Orenco
Miller, S. A.	Milton
Miller, G. W.	Milton
Mt. Tabor Nurseries	Portland
Monte Vista Nursery	Scappoose
Mountain View Floral Company	Montavilla
Mt. Angel Seed and Floral Company	Mt. Angel
Malheur Nursery Company	Ontario
Milton Nursery Company	Milton
Northwestern Nursery	Salem
Oregon Nursery Company	Orenco
Portland Wholesale Nursery Company	Portland
Pilkington, J. B.	Portland
Parker, Geo. H.	Grants Pass
Paterson, H. B.	Medford
Portland Rose Nursery	Portland

Pattack Brothers	Union
Russelville Nursery	Portland
Rahn, Albert E.	Portland
Rae Floral Company	Eugene
Robbins, G. H.	Hood River
Salem Nursery Company	Salem
Stanton, F. H.	Hood River
Southern Oregon Nurseries	Yoncalla
Spencer, H. L.	Eugene
Scott, F. A.	Hood River
Scott-Wood Company	Portland
State Nursery	Salem
True-to-Name Nursery	Hood River
Tualatin Valley Company	Sherwood
Union Nursery	Union
Villa Nursery	Portland
Valley Nursery Company	Hood River
Woodburn Nursery	Woodburn
Willow Flat Nursery	Hood River
Weed Landscape Nursery	Beaverton
Weygandt, F. A.	Beaverton
Woodruff, R. S.	Eugene
Willow Glen Nursery	La Grande
Warner & Gore	Medford
Wist Nursery	Portland

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